FINAL
ENVIRONMENTAL IMPACT REPORT
RESPONSE TO COMMENTS

RUSSIAN RIVER COUNTY SANITATION DISTRICT

EQUALIZATION BASIN STORAGE PROJECT
SCH # 2006032018

JANUARY 2009

Lead Agency:

Russian River County Sanitation District
C/o Sonoma County Water Agency
404 Aviation Boulevard
Santa Rosa, CA

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Russian River County Sanitation District
C/o Sonoma County Water Agency
404 Aviation Boulevard
Santa Rosa, CA

Prepared By:

Analytical Environmental Services
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AES

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CHAPTER 1.0

INTRODUCTION

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INTRODUCTION

1.1 OVERVIEW

This Response to Comments document has been prepared to address comments received by the Russian River County Sanitation District (District/Lead Agency) on the Draft Environmental Impact Report (Draft EIR) for the proposed Russian River Equalization Basin Storage Project (Proposed Project). The Draft EIR was submitted to the State Clearinghouse on August 15, 2007 (SCH# 2006032018). This Response to Comments together with the Draft EIR, as revised, will comprise the Final EIR.

An EIR is an informational document that must be considered by the Lead Agency prior to project approval. CEQA *Guidelines* Section 15132 specifies that the Final EIR shall consist of:

- The Draft EIR or a revision of the draft (Draft EIR and Chapters 3.0 and 4.0 of this Final EIR Response to Comments).
- Comments and recommendations received on the Draft EIR either verbatim or in summary (Chapter 2.0 of this Final EIR Response to Comments).
- A list of persons, organizations, and public agencies commenting on the Draft EIR (Chapter 2.0 of this Final EIR Response to Comments
- Responses of the Lead Agency to significant environmental points raised in the review and consultation process (Chapters 3.0 and 4.0 of this Final EIR Response to Comments).
- Any other information added by the Lead Agency.

1.2 PUBLIC PARTICIPATION PROCESS

The process of environmental review for the Proposed Project was initiated with public release of the Notice of Preparation (NOP) on March 3, 2006. An open house scoping meeting was held at the Sonoma County Water Agency on March 21, 2006. The Notice of Availability (NOA) for the DEIR was released on August 15, 2007. The NOA announced a 45-day comment period running from August 15 to October 1, 2007, as well as a public hearing on September 18, 2007, at the Sonoma County Board of Supervisors Chambers.

The public comment period provides an opportunity for interested public and private parties to provide input regarding the completeness and adequacy of an EIR. CEQA *Guidelines* Section 15151 addresses the standards by which EIR adequacy is judged:

> An EIR should be prepared with a sufficient degree of analysis to provide decision-makers with information which enables them to make a decision which intelligently takes account of environmental consequences. An evaluation of the environmental effects of a proposed project need not be exhaustive, but the sufficiency of an EIR is to be reviewed in the light of what is reasonably feasible. Disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among the experts. The courts have looked not for perfection but for adequacy, completeness, and a good faith effort at full disclosure.

CEQA *Guidelines* Section 15204(a) encourages parties to focus comments on the "sufficiency of the document in identifying and analyzing the possible impacts on the environment and ways in which the significant effects of the project might be avoided or mitigated." Commenters are advised:

> Comments are most helpful when they suggest additional specific alternatives or mitigation measures that would provide better ways to avoid or mitigate the significant environmental effects. At the same time, reviewers should be aware that the adequacy of an EIR is determined in terms of what is reasonably feasible, in light of factors such as the magnitude of the project at issue, the severity of its likely environmental impacts, and the geographic scope of the project. CEQA does not require a lead agency to conduct every test or perform all research, study, and experimentation recommended or demanded by commenters. When responding to comments, lead agencies need only respond to significant environmental issues and do not need to provide all information requested by reviewers, as long as a good faith effort at full disclosure is made in the EIR.

1.3 RESPONSE TO COMMENTS ORGANIZATION

This Final EIR Response to Comments is comprised of this Introduction and the three chapters outlined below:

Chapter 2.0, Comments on the Draft EIR: This chapter includes a list of all agencies, organizations, and individuals who submitted written comments during the public review period for the Draft EIR. The list is followed by copies of original comments received during the public review period for the Draft EIR. Comment letters are each assigned a number, and individual comments are bracketed in the margin.

***Chapter 3.0, Responses to Comments*:** This chapter provides individual responses to each written comment submitted during the public review period for the Draft EIR. Responses are keyed to the bracketed comment numbers provided in Chapter 2.0.

***Chapter 4.0, Text Revisions to the Draft EIR*:** This chapter presents any revisions to the Draft EIR text that were made in response to comments received during the public review

period for the Draft EIR. These revisions are organized by the Section and page number as they appear in the Draft EIR. Additions are indicated with an underline (e.g. impact) and deletions are designated by with a strikethrough (e.g. ~~impact~~).

CHAPTER 2.0

COMMENTS ON THE DRAFT EIR

CHAPTER 2.0

COMMENTS ON THE DRAFT EIR

This chapter contains written comments received during the public review period for the Draft EIR prepared for the Russian River Equalization Basin Storage Project (Proposed Project). The Draft EIR was submitted to the State Clearinghouse (SCH#2006032018) and released for public and agency review for a 45-day review and comment period on August 15, 2007. The comment period closed on October 1, 2007. A total of 10 comment documents were received by the Russian River County Sanitation District (District/Lead Agency) in response the Draft EIR. The agencies, organizations and individuals who provided comments on the Draft EIR are listed in **Table 2-1**. Individual comment letters are provided following this table. As discussed in **Section 1.0**, each individual letter and comment has been bracketed and provided a number in the right-hand margin. This number is cross-referenced with a response in **Section 3.0**.

Additionally, a public hearing for the Draft EIR was held at the Sonoma County Board of Supervisors Chambers on September 18, 2007. A recording of the hearing is available for review at the Sonoma County Water Agency Office, located at 404 Aviation Boulevard, Santa Rosa, CA, 95403. It was determined that all substantive comments provided at the public hearing relative to preparation of the EIR are subsumed with written comments, and therefore are indirectly responded to within **Chapters 3.0** of this Response to Comments document.

It should be noted that neither the comments received on the Draft EIR nor the responses thereto indicate new significant impacts or significant new information that would require recirculation of the Draft EIR pursuant to CEQA *Guidelines* Section 15088.5.

TABLE 2-1
PERSONS, ORGANIZATIONS, AND PUBLIC AGENCIES COMMENTING IN WRITING

Comment Number	Name/Individual(s)	Agency/Organization	Date
Agency Comments			
A01	John Maitland	Sonoma County Transportation and Public Work Department	September 17, 2007
A02	Mike Zumot	California Department of Water Resources-Division of Safety of Dams	October 2, 2007
A03	Denise Tsuji	Department of Toxic Substances Control	September 25, 2007
A04	Katy Sanchez	California Native American Heritage Commission	August 17, 2007
Public Comments			
P01	Jane E. Nielson	Sebastopol Water Information Group (SWIG)	September 24, 2007
P02	Kathy and Ed Smith		September 17, 2007
P03	Brenda Adelman	Russian River Watershed Protection Committee	October 1, 2007
P04	Ellison Folk	Shute, Mihaly & Weinberger LLP	October 2, 2007
P05	Northrop Scientific Institute		September 13, 2007
P06	Ellison Folk	Shute, Mihaly & Weinberger LLP	November 27, 2007

A-01

SONOMA COUNTY

TRANSPORTATION AND PUBLIC WORKS DEPARTMENT

DATE: September 17, 2007

TO: Dale Roberts, SCWA

FROM: John Maitland, TPW

SUBJECT: Russian River County Sanitation District

Equalization Storage Basin Project

DEIR Comments

TPW is concerned with overall impacts to Neeley Road from a road and bridge maintenance standpoint. The following are the most significant concerns:

Section 2.7.2

The project calls for 32,000 cubic yards of import to construct the embankments. Presuming ten-yard trucks, this would result in 3,200 fully legal loaded trucks and 3,200 unloaded trucks operating over Neeley Road. In addition, there could be between 3,000 to 11,000 yards of material off-hauled. This could mean another 300 to 800 loaded and unloaded trucks operating over Neeley Road. TPW anticipates that the existing roadway section will not be able sustain the load impacts attributed to the trucks. To mitigate the structural damage, it will be necessary to overlay the roadway throughout with asphalt concrete to repair the damage. SCWA and TPW staff engineers should meet to discuss the cost responsibility and procedures to have the road overlain with asphalt concrete prior to the winter season following construction.

A01-1

It may also be necessary for the road to be maintained during construction to keep the roadway in a reasonable condition. It will be the responsibility of SCWA to make asphalt concrete repairs, if necessary. Trucks should be limited to a June 1 starting date in order to avoid operating over saturated pavements.

The roadway will need to be cleared of brush and tree limbs for both vertical and horizontal clearance. A minimum of 20' of roadway needs to be cleared in order for trucks to pass each other. Centerline striping will need to be placed prior to commencement of work. Striping will need to be replaced after placement of asphalt concrete overlay at the end of the project.

There is an existing timber deck viaduct that is limited to legal loads. It should be anticipated that the structure may not be able to withstand the amount of truck traffic that the project will

generate. Therefore, a one-lane traffic control system may need to be set up to minimize the structural impacts to the southbound (viaduct) traffic lane. This would be in operation at all times that trucks are operating on the road. SCWA and TPW staff engineers should meet to discuss the structural issues related to the viaduct.

Section 2.7.5

Truck traffic over Neeley Road will be limited to June 1 through October 15.

Section 2.8

An encroachment permit will need to be obtained by the contractor prior to commencement of work. An agreement between SCWA and TPW will need to be executed outlining the responsibilities for roadway repair, hours of work, etc.

A01-1 cont

State of California

The Resources Agency

Memorandum

A-02

Date: SEP 27 2007

To: 1. Ms. Nadell Gayou
Resources Agency Project Coordinator
Environmental Review Section, DPLA
901 P Street
Sacramento, California 95814

2. Mr. Jeff Church
Russian River County Sanitation District
405 Aviation Boulevard
Santa Rosa, California 95403

From: **Department of Water Resources**

Subject: SCH #2006032018, Notice of Completion and Environmental Document Transmittal of Draft Environmental Impact Report (EIR) for Equalization Storage Basin Project of Russian River County Sanitation District, Sonoma County, August 2007

The Division of Safety of Dams has reviewed the draft EIR for the proposed Equalization Storage Basin.

Based on the information provided, we find that the proposed project includes the construction of a wastewater storage basin of 250 feet by 150 feet and a depth of 20 feet, with a maximum storage capacity of approximately 13 acre-feet and a maximum embankment height of 30 feet. As defined in Sections 6002 and 6003, Division 3, of the California Water Code, dams 25 feet or higher with a storage capacity of more than 15 acre-feet, and dams higher than 6 feet with a storage capacity of 50 acre-feet or more, are subject to State jurisdiction. The wastewater storage basin, as proposed, will not be under State jurisdiction for safety. For such cases, the local agency should be consulted for permit related matters.

A02-1

If you have any questions or need additional information, you may contact Office Engineer Chuck Wong at (916) 227-4601 or Regional Engineer Frank Fong at (916) 227-4604.

M. Zumot

Mike Zumot, Acting Chief
Division of Safety of Dams
(916) 227-9800

cc: Governor's Office of Planning
and Clearinghouse
Post Office Box 3044
Sacramento, California 95812-3044

A-03

Department of Toxic Substances Control

Maureen Gorsen, Director
700 Heinz Avenue, Suite 200
Berkeley, California 94710-2721

Linda S. Adams
Secretary for
Environmental
Protection

Arnold Schwarzenegger
Governor

September 24, 2007

Russian River County Sanitation District
Attn.: Mr. Jeff Church
404 Aviation Boulevard
Santa Rosa, California 95403

Dear Mr. Church:

Thank you for the opportunity to comment on the Draft Environmental Impact Report for the Russian River County Sanitation District Equalization Storage Basin Project (SCH# 2006032018). As you may be aware, pursuant to the California Health and Safety Code, Division 20, Chapter 6.8, the California Department of Toxic Substances Control (DTSC) oversees the cleanup of sites where hazardous substances have been released. As a potential Resource Agency, DTSC is submitting comments to help ensure that the environmental documentation prepared for this project under the California Environmental Quality Act (CEQA) adequately addresses any remediation activities pertaining to releases of hazardous substances.

According to the Draft Environmental Impact Report, the proposed project would include construction of a lined earthen equalization basin with a nominal capacity of 3.5 million gallons and auxiliary structures including a pump station, and pipe relocations. The Hazards and Hazardous Materials section of the Initial Study describes historic characterization and remediation of a diesel fuel release on the Russian River County Sanitation District property in 1995. The proposed storage basin location is described as "beyond 50 feet of the former underground storage tank and up-gradient of groundwater flow."

A03-1

We strongly recommend that the Environmental Impact Report include a thorough description of the proposed project area's historical uses from the present back to when the property first contained structures or was first used for residential, agricultural, commercial, industrial, or governmental purposes. Based on that information, sampling should be conducted to determine whether this is an issue which will need to be addressed in the CEQA compliance document. If hazardous substances have been released, they will need to be addressed as part of this project.

SEP 25 2007

For example, if remediation activities include the need for soil excavation, the CEQA document should include: (1) an assessment of air impacts and health impacts associated with the excavation activities; (2) identification of any applicable local standards which may be exceeded by the excavation activities, including dust levels and noise; (3) transportation impacts from the removal or remedial activities; and (4) risk of upset should be there an accident at the Site.

A03-1 cont.

DTSC and the Regional Water Quality Control Boards (Regional Boards) signed a Memorandum of Agreement, March 1, 2005 (MOA) aimed to avoid duplication of efforts among the agencies in the regulatory oversight of investigation and cleanup activities at brownfield sites. Under the MOA, anyone requesting oversight from DTSC or a Regional Board must submit an application to initiate the process to assign the appropriate oversight agency. The completed application and site information may be submitted to either DTSC or Regional Board office in your geographical area.

A03-2

Please contact Ryan Miya at (510) 540-3775 if you have any questions or would like to schedule a meeting. Thank you in advance for your cooperation in this matter.

Sincerely,

Ryan Miya for

Denise M. Tsuji, Unit Chief
Northern California - Coastal Cleanup
Operations Branch

cc: Governor's Office of Planning and Research
State Clearinghouse
P.O. Box 3044
Sacramento, California 95814-3044

Guenther Moskat
CEQA Tracking Center
Department of Toxic Substances Control
P.O. Box 806
Sacramento, California 95812-0806

SEP 25 2007

A-04

STATE OF CALIFORNIA
NATIVE AMERICAN HERITAGE COMMISSION
915 CAPITOL MALL, ROOM 364
SACRAMENTO, CA 95814
(916) 653-4082
(916) 657-5390 - Fax

Arnold Schwarzenegger, Governor

August 17, 2007

Jeff Church
Russian River Sanitation District
404 Aviation Boulevard
Santa Rosa, CA 95403

RE: SCH#2006032018 Equalization Storage Basin Project; Sonoma County.

Dear Mr. Church:

The Native American Heritage Commission (NAHC) has reviewed the Notice of Completion (NOC) regarding the above project. To adequately assess and mitigate project-related impacts on archaeological resources, the Commission recommends the following actions be required:

- Contact the appropriate Information Center for a record search to determine:
  - If a part or all of the area of project effect (APE) has been previously surveyed for cultural resources.
  - If any known cultural resources have already been recorded on or adjacent to the APE.
  - If the probability is low, moderate, or high that cultural resources are located in the APE.
  - If a survey is required to determine whether previously unrecorded cultural resources are present.
- ✓ If an archaeological inventory survey is required, the final stage is the preparation of a professional report detailing the findings and recommendations of the records search and field survey.
  - The final report containing site forms, site significance, and mitigation measurers should be submitted immediately to the planning department. All information regarding site locations, Native American human remains, and associated funerary objects should be in a separate confidential addendum, and not be made available for pubic disclosure.
  - The final written report should be submitted within 3 months after work has been completed to the appropriate regional archaeological Information Center.
- ✓ Contact the NAHC for a Sacred Lands File Check.
  - **Check Completed with negative results, 08/17/07**
    The absence of specific site information in the Sacred Lands File does not indicate the absence of cultural resources in any project area. Other sources of cultural resources should also be contacted for information regarding known and recorded sites (see below).
- ✓ Contact the NAHC for a list of appropriate Native American Contacts for consultation concerning the project site and to assist in the mitigation measures.
  - **Native American Contacts List attached**
    The NAHC makes no recommendation or preference of a single individual, or group over another. This list should provide a starting place in locating areas of potential adverse impact within the proposed project area. I suggest you contact all of those indicated, if they cannot supply information, they might recommend other with specific knowledge. If a response has not been received within two weeks of notification, the Commission requests that you follow-up with a telephone call to ensure that the project information has been received. If you receive notification of change of addresses and phone numbers from any these individuals or groups, please notify me. With your assistance we are able to assure that our lists contain current information.
- ✓ Lack of surface evidence of archeological resources does not preclude their subsurface existence.
  - Lead agencies should include in their mitigation plan provisions for the identification and evaluation of accidentally discovered archeological resources, per California Environmental Quality Act (CEQA) §15064.5 (f). In areas of identified archaeological sensitivity, a certified archaeologist and a culturally affiliated Native American, with knowledge in cultural resources, should monitor all ground-disturbing activities.

A04-1

- Lead agencies should include in their mitigation plan provisions for the disposition of recovered artifacts, in consultation with culturally affiliated Native Americans.
- Lead agencies should include provisions for discovery of Native American human remains in their mitigation plan. Health and Safety Code §7050.5, CEQA §15064.5 (e), and Public Resources Code §5097.98 mandates the process to be followed in the event of an accidental discovery of any human remains in a location other than a dedicated cemetery.

A04-1 cont.

Sincerely,

Katy Sanchez

Katy Sanchez
Program Analyst
(916) 653-4040

CC: State Clearinghouse

Native American Contacts
Sonoma County
August 17, 2007

The Federated Indians of Graton Rancheria
Gene Buvelot
PO Box 14428 — Coast Miwok
Santa Rosa , CA 95402 — Southern Pomo
coastmiwok@aol.com
(415) 883-9215 Home

Ya-Ka-Ama
6215 Eastside Road — Pomo
Forestville , CA 95436 — Coast Miwok
yakaama.indian.ed@att.net — Wappo
(707) 887-1541

Dry Creek Rancheria of Pomo Indians
Harvey Hopkins, Chairperson
P.O. Box 607 — Pomo
Geyserville , CA 95441
drycreek@sonic.net
(707) 473-2178

The Federated Indians of Graton Rancheria
Greg Sarris, Chairperson
PO Box 14428 — Coast Miwok
Santa Rosa , CA 95402 — Southern Pomo
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707-578-2233 - EXT 204
707-578-2299 - fax

Lytton Rancheria Band of Pomo Indians
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(707) 575-6974 - Fax

Lytton Band of Pomo Indians
Lisa Miller, Tribal Administrator
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(707) 575-5917
(707) 575-6974 FAX

Stewarts Point Rancheria
Eric Wilder, Chairperson
3535 Industrial Dr., Suite B2 — Pomo
Santa Rosa , CA 95403
tribalofc@stewartspointrancher
(707) 591-0580 - Voice
(707) 591-0583 - Fax

Stewarts Point Rancheria THPO
Reno Franklin, Tribal Historic Perservation Officer
3535 Industrial Dr., Suite B2 — Pomo
Santa Rosa , CA 95403
reno@stewartspointrancheria.
(707) 591-0580 EXT 105
(707) 591-0583 FAX

This list is current only as of the date of this document.

Distribution of this list does not relieve any person of statutory responsibility as defined in Section 7050.5 of the Health and Safety Code, Section 5097.94 of the Public Resources Code and Section 5097.98 of the Public Resources Code.

This list is only applicable for contacting local Native Americans with regard to cultural resources for the proposed SCH# 2006032018 Equalization Storage Basin Project; Sonoma County.

Native American Contacts
Sonoma County
August 17, 2007

Stewarts Point Rancheria
Lynne Rosselli, Environmental Planning Department
3535 Industrial Dr., Suite B2 Pomo
Santa Rosa , CA 95403
lynne@stewartspointrancheria
(707) 591-0580 ext107
(707) 591-0583 FAX

Lytton Band of Pomo Indians
Cathy Lopez, Vice Chairperson
1300 N. Dutton, Suite A Pomo
Santa Rosa , CA 95401
cathylopez@aol.com
(707) 575-5917
Fax: (707) 575-6974

Lytton Band of Pomo Indians
Environmental Planner
1300 N. Dutton, Suite A Pomo
Santa Rosa , CA 95401
(707) 575-5917
(707) 575-6974 FAX

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This list is only applicable for contacting local Native Americans with regard to cultural resources for the proposed SCH# 2006032018 Equalization Storage Basin Project; Sonoma County.

P01

SWiG
SEBASTOPOL WATER INFORMATION GROUP

September 20, 2007

Jeff Church
Sonoma County Water Agency
P.O. Box 11628
Santa Rosa, CA 95406

Re: Sebastopol Water Information Group (SWiG) Comments on the Draft Environmental Impact Report (DEIR) for the proposed Russian River County Sanitation District's (RRCSD) "Equalization Basin."

SWiG is an alliance of west County well owners and Sebastopol residents, which provides Sonoma County citizens with accurate scientific information on water supplies and quality. **We find that the Draft EIR for the proposed Russian River Community Services District (RRCSD) "Equalization Basin" Project is incomplete and insufficient because it does not include the accurate geologic site assessments in geotechnical studies by Giblin Associates (comment references 1, 2), which are referenced in the DEIR, and in other reports going back to 1997** (note that the DEIR references, Appendix 4, spell the Giblin name incorrectly, as "Gibblon").

Because the DEIR does not discuss or evaluate the likely impacts of some geologic hazards that the Giblin Associates reports identified, the proposed mitigations are inadequate to protect the local environment from the effects of either construction or long-term operation of this project.

The basin is proposed for a site within the property boundary of the RRCSD wastewater treatment plant (WWTP). The proposed site is on relatively gently-sloping terrain, at the base of very steep slopes formed on unstable Franciscan Formation materials.

P01-1

In particular, the DEIR:

- contains incorrect and misleading geologic descriptions, in spite of the availability of the correct and thorough geologic site characterizations in geotechnical study reports, which are referenced in the DEIR's Appendix 4, and readily available for examination;
- identifies the soil on the site only generally, ignoring significant details of subsurface variations critical to understanding the stability of the site, derived from extensive geotechnical soil studies at the site, done at public expense, and which are referenced in the DEIR (Appendix 4);
- minimizes the potential for slope failures (landslides, debris flows) on steep slopes adjacent to the equalization basin site, which could disrupt the basin's integrity if slides came onto the site, and therefore does not adequately assess or mitigate that potential;
- does not consider the potential landslide and debris-flow generation from severe earthquake shaking;
- minimizes hydrologic issues, especially the potential for groundwater levels to rise higher than the equalization basin's design floor.

The following section examines these issues in greater detail.

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Geological Resources (Section 3.2)
The DEIR's **Geology and Soils section** (p. 3.2-1 to 3.2-2) states that both Franciscan and "Merced" Formations underlie the site where the equalization pond will be built. The DEIR preparers ignore the fact that the rock coeval with Merced Formation in Sonoma County had been distinguished from more southerly units, and renamed "Wilson Grove Formation" more than 30 years ago (3).

Since all recent geologic maps of western Sonoma County (4, 5, 6) state or show that the basin site, and all the rest of the WWTP property, are underlain entirely by geologically-hazardous Franciscan Formation, SWiG geologic experts examined the geotechnical site studies performed for the project by Giblin Associates (E, F, and earlier studies referenced in those reports). These reports should be the main sources of information in the Geology and Soils section.

We found that the Giblin Associates site-specific reports to be very thorough and accurate, however. They do not mention any occurrence of "Merced" (or Wilson Grove) Formation at the site. **SWiG is forced to conclude that the Geology and Soils section is a product of either negligence, lack of concern for accuracy in this report, or an intent to mislead readers who lack geologic expertise.** Evidence of an intent to mislead includes the reference given with the identification of "Merced" Formation at the site--it is a geologic map of the entire United States, at the very small scale of 1: 250,000 (7). There is no possibility that the geology of such a small site can be accurately defined from such a small-scale geologic map. More evidence is the lack of a site geologic map, which would show the distribution of more than one geologic unit relative to the project footprint. The DEIR also incompletely describes characteristics of the Franciscan Formation, while including details about the so-called "Merced" Formation from work that is not applicable to Sonoma County (8). P01-2

Giblin Associates soil studies of the basin site (1, 2) and other WWTP areas (1) show widely variable soil characteristics across the construction area and with depth. Yet the DEIR also neglects these studies, simply characterizing the site's soils as "Yolo sandy loam" (p. 3.2-2).

Seismicity and Shaking Intensities (p. 3.2-2 to 3.2-6)
DEIR's discussion of seismic effects is limited to direct ruptures by active faults; however some Giblin Associates' soil test holes (1) intersected Franciscan rocks with highly deformed and sheared intervals. Such sheared zones can become the foci for subsurface slippage during earthquakes on nearby active faults, all of which are within 30 miles of the site (E, p. 20).

In a large earthquake, the DEIR states that the site is likely to exhibit Mercalli shaking intensities of VIII to IX (p. 3.2-6). Shaking at level VIII can cause liquefaction in susceptible areas, and shaking at IX can cause considerable damage in "specially-designed structures." P01-3

In examining the effects of seismicity and shaking potentials, the DEIR states that the proposed equalization basin's impact intermediate construction will act as a "deep ground treatment" to *reduce* the liquefaction potential. **But the DEIR does not explain how this construction will reduce liquefaction, nor how much liquefaction could occur without rupturing levees and structural supports.** Neither does the DEIR explain how the proposed "specially-designed structure" for the basin could withstand the g-forces of Mercalli IX level earthquake shaking.

Landslides (p. 3.2-6 to 3.2-12)
This is probably the DEIR's worst section, because it omits the full history of debris flow activity that Giblin Associates (1, 2) discovered at depth in the equalization pond site, and along Neeley Road, which will be used to haul excavated material out of, and construction materials into, the site. P01-4

The DEIR's finding that landslide potentials at the site are less than significant is highly incorrect and misleading. We have been forced to the conclusion that the incompetent and incorrect Geology and Soils section (see above) was formulated to obscure the geologically hazardous nature of of the site.

Known debris flow activity includes a 1992 event that partly buried a fence on the northeastern part of the WWTP property and a large event that extended into a more central effluent storage reservoir (1); a 1995 or 1998 debris flow that affected the entrance roadway upslope from the proposed basin site; and a 2006 debris flow that washed 5 to 6 feet of material onto the WWTP property. The DEIR also omits mention of the 2005-06 landslide on Neeley Road. In addition, the DEIR barely mentions Giblin Associates discovery of substantial organic debris in test borings into the basin site soils (2), which suggest a potential for large-scale debris flow activity at the WWTP and the basin site. **All these data demonstrate that the WWTP area has a high hazard for destructive debris flows.**

Giblin Associates (2) also found debris flow paths upslope from and possibly within the basin site area, from both the northwest (west side of site) and from the N (east side of site). The 2005-06 Neeley Road landslide also suggests that slope instabilities could cut off access to the construction site in wet weather. Giblin Associates (1) also noted that concentrated road runoff into natural drainages upslope from the site can increase debris flow risks.

The DEIR does not mention any of these important details bearing on the site's instability and potential for debris flows to damage to the equalization basin's levees. The basin is intended to hold raw sewage, partially treated effluent, or fully treated effluent at different times. The high debris flow potential suggests a potential for landsliding from south-facing slopes, which could shed enough debris to displace contaminated water from the basin, releasing whatever materials it holds at the time onto lower slopes, and into the Russian River.

P01-4 cont.

The DEIR's proposed landslide mitigation is a small existing retaining wall (p. 3.2-12), which was built after a debris flow crossed the WWTP boundary (location not specified). **But solid retaining walls are poor protection against debris flows, and no competent geologist, clearly including those at Giblin Associates, would support this ludicrous suggestion.** Instead, the Giblin Associates report (1) states correctly that any facility constructed in a debris-flow prone area is subject to future damage and higher than normal maintenance levels, and it proposed a number of upslope mitigations to protect all WWTP structures. The mitigations included building berms around structures, and placing a number of debris fences at various upslope levels. This report also advises that all protective structures have to be continuously maintained, which means providing maintenance funding in future budgets.

Hydrology and Groundwater (p. 3.3-1 to 3.3-4)

Groundwater levels below the equalization basin site are relatively high, and may fluctuate substantially with the seasons. The DEIR's Appendix 7 shows that the site is centered about 125 ft above the river. The lowest structure elevation is 55 feet above sea level, on the assumption that the highest groundwater levels for the site are around 45 ft above sea level (10 ft below ground surface). But one of the Giblin Associates report (1) suggested that groundwater levels could rise to 6 ft bgs in a wet year. Groundwater levels higher than the basin floor would build pressure, to weaken a concrete foundation or (and) rupture a liner.

Giblin Associates ruled out construction of basin retaining wall back drain or subsurface drain systems, due to the likely lack of outlets during high water times. Lowering groundwater with pumps is an option, but one that could lower the groundwater table and cause damage to overlying structures. The engineering consultant report referenced in the DEIR (9) recommended constructing groundwater monitoring wells, so that rising groundwater could be selectively mitigated by pumping at high water times. Those times are likely to coincide with high river levels, however, leaving few options for disposal of the pumped groundwater.

P01-5

All of these issues are discussed in the consultants' reports, but these discussions and the many alternatives analyzed and costed are barely discussed in the DEIR.

Conclusions

SWiG has grave concerns about the DEIRs omissions and the evidence that some sections critical for properly designing and constructing an equalization basin on liquefiable soils and at the base of

P01-6

unstable slopes, were written to be purposely misleading. It is hard to avoid this implication, because the background study reports are so careful, complete, and revelatory.

SWiG has to conclude, and strongly urges, that this DEIR must be rewritten and re-circulated for public comments. When re-written, the DEIR must:

- correctly characterize the geologic setting, and include a site map showing the soil sample sites, with keys to the critical characteristics of those samples;
- contain additional maps, showing locations of the geologic hazards identified by Giblin Associates' (1, 2), including a map of the area from Vacation beach to the WWTP, showing all local landslides, and the sites of debris flow activity since construction of the WWTP;
- include descriptive and tabulated information about the variable character of soils, including the irregular distribution of weak soils, and evidence for large debris flow deposits beneath the equalization basin site, keyed to the Giblin sample sites (shown on a map in the DEIR);
- examine the effects of earthquake shaking levels at Mercalli VIII and IX levels on the preferred design, and assess the features that can minimize the threat of rupture to "specially designed structures," at Mercalli Intensity IX;
- thoroughly discuss the implication of liquefaction potentials at the basin site, and include engineering analyses to show how various designs will reduce liquefaction potentials. This discussion must include more precise information about the potential outcome of even small degrees of liquefaction beneath the basin;
- include the Giblin Associates' copious reports of recent debris flows activity, and thoroughly discuss debris flow potentials, for the site, the WWTP property, and Neeley Road;
- examine the potential for landslide and debris-flow generation from severe earthquake shaking,
- devise much better mitigations to protect the basin from large landslides and debris flows in very wet years;
- discuss the level and costs of continual monitoring and maintenance of mitigating structures;
- relate the current basin design to the numerous different groundwater levels recorded in different soils surveys over time, making sure to relate the water levels to the elevation of the basin floor;
- discuss the susceptibility to leakage of the various types of reservoir liners considered;
- include the cost assessments for proposed alternative construction designs (9), and continual groundwater level monitoring wells, and pumping facilities, and facility maintenance.

P01-6 cont.

Sincerely,

Jane E. Nielson

Dr. Jane. E. Nielson, Geologist
President, Sebastopol Water Information Group

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21 SEP 2007 PM 1 T

Jeff Church
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P02

Sonoma County Water Agency Attn: Jeff Church, Senior Environmental Specialist
PO Box 11628
Santa Rosa, CA 95406

Dear Mr. Church,

We are extremely concerned about the construction of the equalization basin at the Guerneville Sewage Treatment plant. We live approximately ½ mile from the plant. The Treatment Plant is at the end of Neeley Road. Neeley Road is the only winter access for the residents of Vacation Beach. We have lived here for 25 years. During that time, we have often thought about how tenuous our connection with Guerneville and beyond actually is. We are frequently cut off by even the lowest "flooding" and often get our power back well after other areas.

Neeley Road is a narrow road that is perched between the hillside and the river on a steep bank for about a third of the distance between Highway 116 and the sewer plant. Several years ago, there was construction at the treatment plant involving movement of large amounts of soil similar to what is being proposed. As the project continued, the deterioration of the roadbed was visible. We believe that the disastrous sliding of the road during the winter of 2005-2006 was a direct result of sending heavy trucks over a fragile road. The foundation of the road itself was damaged. For months, all traffic, including the school bus had to thread their way down one lane past half of the road which had slid into the Russian River. The road looks half way decent now because it has been partly repaired. Those who travel it daily know that there are places where cracks were filled and paved over. The damage done by the first group of trucks cannot be completely erased.

P02-1

We suggest that minimally, an alternate route be developed for truck access. We realize that Neeley Road is the only public access currently. There is the possibility of improving the access to Mayes Canyon Road which would impact the daily lives and access of far fewer people. Create an access through Bohemian Grove. Especially if work is done during the wet season, the heavy truck traffic is likely to cause extensive damage to an already compromised roadway and affect the stability of the properties above and below the road. After watching the condition of the road deteriorate last time, we would feel confident in predicting road failure if soil is carried in any volume in and out over Neeley Road.

Sewage treatment is an absolute necessity, but the wisdom of piping a large percentage of the sewage from Western Sonoma County to a location not only near the River, but known to be IN the river during flooding is beyond us. In the end, saving money now is risking a major problem later. The current plant handles the current load. Expansion of this magnitude would not be necessary if sewage from outlying areas were dealt with closer to the source. Build another plant. This expansion theoretically allows for the consideration of adding the outlying areas at the expense of more road work to install more pipes. On one final note, you will understand the irony of the fact that those in the closest proximity to the plant itself are still using septic systems. We are being asked to bear the brunt of the inconvenience while not being given the opportunity to access the service.

P02-2

Please look closely at the way the work would affect the roads, especially Neeley Road. It literally could be a disaster in the making.

Sincerely,

Kathy Smith Ed Smith

Kathy and Ed Smith
18120 Neeley Rd.
Guerneville, CA 95446

P03

RRWPC
Russian River Watershed Protection Committee

Post Office Box 501
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(707) 869-0410

Russian River Watershed Protection Committee (RRWPC)

Comments on DEIR: Russian River County Sanitation District Equalization Storage Basin Project: August, 2007

Submitted: October 1, 2007 by Brenda Adelman

General Comments:

Ellison Folk of Shute, Mihaly, and Weinberger, recently submitted comments on our behalf regarding legal issues concerning the Equalization Storage Basin Project. (California Environmental Quality Act known as CEQA). We fully concur with her comments and consider them as part of our own. We have also been working with Dr. Jane Nielson, former geologist with USGS for over 20 years, who has also submitted comments on this project regarding geological hazards, and we fully concur with her comments as well. Since this project is far more limited than other projects we have commented on, and since Ms. Folk and Dr. Nielson have stated most of our major concerns, our comments will be mostly limited to things they did not cover. P03-1

As you may know, RRWPC has been tracking issues concerning the Russian River County Sanitation District (RRCSD) since our founding in 1980. Since 1995, when Sonoma County Water Agency took over management of the District (RRCSD) and commenced planning for its regionalization, we have indicated our concerns regarding this plan. The regionalization concept has taken many twists and turns over the last 12 years, but is currently in the form of three piece-meal projects proposed to expand the RRCSD treatment system (32 mile summer irrigation pipeline, disinfection project and this storage project) and a fourth project involving the hookup of Occidental and Camp Meeker to our system. The latter DEIR was paid for by SCWA but the Camp Meeker Recreation and Park District serves as lead agency, and it was written by the firm, Brelje & Race.

RRCSD Master Plan Required:

All of this is contrary to the County General Plan, which calls for Master Plans of Districts before doing projects. Policy PF-1b on page 406 of the Planning Commission Recommended Draft states, *"Prepare or encourage the preparation of master plans or equivalent documentation for all wastewater management systems prior to approval of project facilities. Design and construct all facilities in accordance with general plans of the applicable jurisdictions. In the event that a master plan or monitoring fails to show adequate facilities or supplies for planned growth, consider moratoria on plan amendments, zoning changes, building permits or other entitlements in order to protect services to existing residents. The minimum contents necessary for an adequate master plan or equivalent documentation are:* P03-2

- *Maps showing future service area boundaries,*
- *Forecasted growth that reflects all potential sources of future demand for facilities and the relationship to General Plan projections and limits,*
- *Projected service and facility needs,*
- *Estimated costs and revenues for needed improvements,*
- *System design parameters and assumptions,*
- *A program for water use reduction,*
- *A program to reduce storm water infiltration, and*
- *A program to monitor and account for amendments of the General Plan land use map over time.*

The issue of a master plan was not addressed in this DEIR or any other RRCSD projects. A few of the items above were covered separately in individual DEIRs, but most were not, and there has been no comprehensive review as required by CEQA and fully noted in Ms. Folk's comments. For example, we have seen no map of FUTURE service area boundaries, and in fact, LAFCO is waiting until the General Plan review process is complete before they finalize them. (See pages 3-6 of **Attachment #1**) It is interesting that many General Plan policies were noted in the DEIR (3.3-9 and 3.3-10), but not this one. P03-2 cont.

RRWPC submitted scoping comments on this project on April 24, 2006, where many of these concerns were enumerated. The comments have been included in this DEIR with no response. We commented extensively (as did Ms. Folk and Dr. Nielson) on the Irrigation Project document and the Camp Meeker/Occidental (CM/OCC) Pipeline Project DEIR. We expressed strong concerns about the bifurcation of this project and lack of a Master Plan. We would appreciate a full response to these issues.

We submitted comments that highlighted potential growth-inducing and cumulative impacts on our area from all four of these projects. (RRWPC noted concerns about growth impacts on the Disinfection project as well, although we announced that we would not challenge the Disinfection Project as it was badly needed by the current District to prevent and avoid penalties for illegal discharges.) We also attach recent comments submitted on the Public Facilities Element of the General Plan which detail many of our concerns about the circumstances surrounding these projects and West County wastewater issues in general (**Attachment #1**). P03-3

Treatment Plant capacity challenged:

There has been a lack of candor throughout this process about the actual capacity of the RRCSD Treatment Plant. While on the one hand SCWA funded the CM/OCC Pipeline Project DEIR, which would hook those communities to RRCSD, on the other, the DEIR implies that specific projects are for current ratepayers only. On page 4-2 of this DEIR, it states, "*Construction of the equalization basin is necessary to accommodate existing conditions and would not increase the treatment or discharge capacity of the existing facility.*" By saying that the P03-4

project accommodates "existing conditions", this statement implies that it will not support new hookups. In another sense, while it is true that the project BY ITSELF would not allow for increased capacity, it could allow new hookups based on current methods used for determining capacity. In fact the Camp Meeker DEIR claims that there is adequate capacity at the current treatment plant to serve the two communities. (**Attachment #2:** RRWPC Comments on CM/OCC DEIR. Yet in conjunction with the other projects, that is simply not true. In a Resolution on Mar. 7, 2006, the Board of Supervisors (Item #6) (**Attachment #3**) authorized an outside service agreement of 24 hookups for Applewood Resort, it stated, "2. *The District has the treatment and disposal capacity to provide the requested sewer service.*" And that was before the storage, disinfection, and summer irrigation pipeline were proposed.

Right now a 48 unit low income apartment building is being considered to be placed on stilts in the flood plain. What impact would that have on capacity, especially during high water periods?

What is the capacity of RRCSD? If one were to simply look at average dry weather flow, it appears more than adequate. Generally, flows to the treatment plant are a little less than half the rated capacity based on summer flows only. Yet there are several factors not considered in this situation. First, capacity is required to be reserved for all current ratepayers who wish to expand the size of their houses, thereby adding to its use, and/or convert from summer only use to full time. There has never been an analysis of the full potential use if these changes were factored in. Since the system has gone on line, many houses have been greatly expanded, often filling most of the space of their lots.

P03-4 cont.

The main issue however, is that capacity problems exist much more in the winter than the summer because of all the infiltration and inflow into the system during high water periods. The treatment plant generally gets inundated when the river exceeds 40 feet at the Guerneville gauge. This problem has not been successfully ameliorated by either the Third Unit Processes Project or changes in sewage flow rates to the treatment plant during high flows. Part of the problem is the duration of the high flows. In 1998, the flows weren't particularly high, the river only flooded once at around 34', but the rain persisted for almost the entire month; there was a major slide at the treatment plant, and the system was out of commission for about two weeks.

I include the entire LAFCO packet from July 5, 2006 (**Attachment #4**), which contains emails from Randy Cullen that illustrate the problems at the treatment plant during the flood in January, 2006. The LAFCO staff report states on page 3, "*...staff has conferred with representatives of PRMD, Russian River County Sanitation district, operated by the Sonoma County Water Agency, and North coast Regional Water Quality Control Board, who believe that the District is operating adequately and can accommodate an increased wastewater flow generated by the affected territory.*" The letter went on to state that the North Coast Board made no comment on the project.

In the same packet, Randy Cullen states in an email, "*The flow through the filters is 1850 gallons per minutes (2.6 million gallons per day) with a turbidity of 4 NTU. The 24-hour average permit limit is 2 NTU. I have gone over the 2 NTU limit to reduce the*

amount being diverted from the plant process. The plant was upgraded to handle a flow of 3.5 million gallons per day (about 2400 gallons per minute) while maintaining a 24-hour average turbidity of 2 NTU. The plant is currently unable to meet that." This quote speaks for itself. Yet in granting the Out of District Service Agreement, LAFCO ignored this information.

The above-mentioned packet contains a summary of RRCSD monitoring information for 2005 indicating many other permit violations (See 2005 Annual Summary Self-Monitoring Report For RRCSD). In fact, the year before, the Regional Board had issued an Administrative Civil Liability Order No. R1-2005-0062 (**Attachment #5**) based on permit violations from January 11, 2000 through August 2, 2004. We have been told that staff is currently working on subsequent violations which would include the period in question. The report attached details the violations. Mandatory minimum penalties charged for violations of that period was $63,000, representing a minimum of 63 serious permit violations.

P03-4 cont.

The annual self monitoring report for 2005 indicated that there were at least 78 permit violations, several of which were over extended periods, particularly at the end of the year during the big storm. (Self-monitoring report is part of Attachment #4) We have not examined 2006 data as yet, but since it was a much drier year, it probably did not have the same problems as in 2005.

Storage Basin Project inadequate for current ratepayers

In January, 1995, the river saw serious floods in both January and March. In the May, 1998 DEIR (page 6) it states, *"actual flows experienced during January 1995 flood: The January 1995 flood had a duration of 8 days and the District "bypassed" approximately 18 million gallons of inflow during that time. Storage component alternatives under this influent flow condition assume that 18 million gallons of influent storage capacity would be needed to prevent "bypass" operations during events as experienced during the January 1995 flood."* (**Attachment #6)**

A footnote states, *"Bypass operations occur during flood conditions. Under these conditions, the District's lift stations become flooded which causes flood waters to inflow to the treatment facility, requiring the District to "bypass" the treatment process at the facility's headworks. Inflow, which is commingled flood water and influent, is routed directly to the lower storage reservoir where it is disinfected with chlorine and is then discharged to the Russian River."* I might add that "bypass" is a permit violation.

P03-5

But then in the Long Term Solutions Report to the Regional Board in December, 1998, in Table 1, (Also Attachment #6) the required Equalization Storage required is 30.5 million gallons. This is a far cry from the 3.5 million gallons currently planned, bringing total storage to 7.0 million gallons, less than one fourth of what is needed. How can anyone say there is adequate capacity for new hookups?

Other Concerns

We mentioned support earlier for Dr. Nielson's comments on the geological concerns for this project. We are particularly concerned about the fact that the whole area of the treatment plant is subject to landslides, as is the single road leading into the facility (Neeley Rd.) and that this DEIR did not adequately incorporate the suggestions of geological consultant reports. We also feel trepidation about the fact that the bottom of the basin will just be a few inches

P03-6

over the high water levels that have been tested thus far. Were any tests conducted in late February, 1986? What will happen to the basin in a similar flood or, what if there is a worse event? P03-6 cont.

We are also very concerned about the fact that the Basin will contain raw sewage, partially treated wastewater, and fully treated wastewater at different times of the year. The DEIR does not adequately explain how all of the raw and partially treated sewage will be removed from the basin so as to not contaminate the fully treated wastewater, which will be used for discharge and for irrigation. They simply state that they will fill the basin with treated effluent and then retreat all the effluent again. But it is our understanding that the City of Santa Rosa never can remove more than about 75-80% of the wastes in their ponds. How is RRCSD going to remove 100%, even after filling with treated wastewater and retreating the wastewater? It still doesn't address the problem completely. P03-7

How will the system work during heavy storm flow scenarios when even the new storage would be way inadequate? In a situation similar to Jan. 1, 2006, what would happen once all the ponds filled up and the influent backed up in the pipeline? As we mentioned earlier, approximately four times more storage is really needed for this system to be fully compliant. While we realize that new storage will help, how far will this current storage take us? P03-8

On page 2-1 the DEIR seems to refer to raw sewage as untreated effluent. Doesn't the word effluent refer to TREATED waste, and the word INFLUENT refer to raw sewage? We request a more clear and candid description of this whole process. P03-9

We are concerned about the viability of the liner in protecting the groundwater, especially if levels go higher than anticipated. How will the project meet compliance with anti-degradation water quality objectives? Will the liner standards meet those in Title 27, Division 4, Article 4? Will ground water monitoring take place on a regular basis after the basin is constructed? Concern is expressed about this situation (page 3.3-15), but we are not sure that the potential remedies would be adequate if the ground water goes much higher than the anticipated 55'. Since raw sewage would be in the pond at that point, it might be helpful to anticipate what would happen if the pond liner fails and raw sewage is released. How would such a situation be dealt with? This DEIR seems to put off some of the details until the basin design is complete. Will there be another DEIR at that time? Will the environmental review process be reopened? P03-10

RRWPC submitted numerous articles about endocrine disrupting chemicals including pharmaceuticals and other unregulated toxic substances with the DEIR on the Irrigation Project. We would like to request that they all be part of the record for this project as well. Among others, we had submitted a 200 page assemblage of many articles on the toxicity of many of the substances found in wastewater. Now we are particularly concerned, that because these substances aren't monitored, and because untreated sewage may contaminate treated wastewater that then gets discharged, how can we be sure these contaminants won't be released into the general environment? Will heavy metals, organic chemicals, emerging pollutants, bacteria, nitrates, and salts be regularly

monitored in the storage basin, especially after switching from raw sewage to fully treated effluent? P03-10 cont.

On another issue, we only feel sympathy for the people who live along Neeley Road, especially those who will suffer greatly during construction and not even have the benefit of being able to hook up. Having a phone number for people to call and giving them advance warning about how you will disrupt their lives moving 3200 heavy truck loads of fill down their fragile road, is simply not enough. Again we refer to Dr. Nielson's comments and can't help but wonder what permanent damage might be done to their only access road that tends to slide badly in the winter time. It seems as though much more analysis is needed as to the potential risk, and what culpability the District will have to assume in the advent of disaster. What is the potential liability to the District if the road gives in or the hillsides fail as a result of this project? It seems like that should be factored into the cost. P03-11

How much of the water in the basin is likely to evapotranspirate? Will any of the toxins in the water aerosol into the environment? Please describe the potential for this happening and the means you could use to prevent it. P03-12

Since the treatment plant was always an area that suffered from mosquito problems, we wonder if the problems would be exacerbated by having the large pond there? Many years ago I heard that someone living near the treatment plant had encephalitis that may have been caused by those mosquitoes. Have any cases been cited in the last few years? Does Mosquito Abatement check the area regularly? How will you control mosquitoes around the basin? P03-13

Finally, how will this project be funded? What would be the rate increase for current ratepayers? How would rates be affected if this project and the disinfection projects are built but not CM/OCC pipeline or summer irrigation project? We look forward to your response. P03-14

List of Attachments

1. RRWPC Comments on Sonoma County General Plan Public Facilities Element; Sept. 28, 2007
2. RRWPC Comments on CM/OCC DEIR Pipeline Project to RRCSD; Aug. 14, 2007
3. Board of Supervisors Resolution: March 7, 2006 Agenda, Item #6
4. LAFCO Packet: July 5, 2006
5. California Regional Water Quality Control Board, North Coast Region, Administrative Civil Liability Order No. R1-2005-0062, Mandatory Minimum Penalties For Violations of Waste Discharge Requirements Order No. 92-51 and R1-2003-0026, In the Matter of Sonoma County Water Agency and Russian River County Sanitation District Wastewater Treatment Facility WDID No. 1B820450SON
6. RRCSD DEIR, Facilities Upgrades and Disposal Expansion Project, Pg. 6, May 4, 1998, Long Term Solutions Report, 12-1-98, Pg. 5 & 6

P04

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September 28, 2007

Via U.S. Mail and Electronic Transmission

Jeff Church
Sonoma County Water Agency
404 Aviation Blvd.
Santa Rosa, CA 95406

Re: Draft Environmental Impact Report for the Equalization Storage Basin Project

Dear Mr. Church:

This firm represents the Russian River Watershed Protection Committee ("RRWPC") on matters related to the environmental review of the Equalization Storage Basin Project ("the Project") proposed by the Russian River County Sanitation District ("RRCSD") and the Sonoma County Water Agency ("SCWA"). RRWPC is dedicated to protecting the unique resources and rural community of the Russian River area.

The purpose of this letter is to inform the RRCSD and the SCWA that the Draft Environmental Impact Report ("DEIR") for the Project fails to comply with the requirements of the California Environmental Quality Act ("CEQA"), Public Resources Code § 21000 *et seq*., and the CEQA Guidelines, California Code of Regulations, title 14, § 150000 *et seq*. ("CEQA Guidelines").

P04-1

Because the DEIR fails to comply with CEQA, it must be revised and recirculated for public comment before the Project may be approved.

OCT 2 2007

I. The DEIR Does Not Contain An Adequate Description of the Project, It's Purpose and Need.

Under CEQA, EIRs must contain a clear and comprehensive project description. The EIR's project description is critical to meaningful public review. *See City of Redlands v. County of San Bernardino*, 96 Cal.App.4th 398, 406 (2002). Among other components, an EIR's project description must contain a "general description of the project's technical, economic, and environmental characteristics, considering the principal engineering proposals if any and supporting public service facilities." CEQA Guidelines § 15124(c). "A curtailed or distorted project description may stultify the objectives of the reporting process. Only through an accurate view of the project may affected outsiders and public decision-makers balance the proposal's benefit against its environmental cost, consider mitigation measures, assess the advantage of terminating the proposal . . . and weigh other alternatives in the balance. An accurate, stable and finite project description is the *sine qua non* of an informative and legally sufficient EIR." *County of Inyo v. City of Los Angeles,* 71 Cal.App.3d 185, 192-93 (1977) . P04-2

The DEIR's discussion of the Project and its purpose are internally inconsistent. In particular, the DEIR claims that the Project is necessary to ensure compliance with the District's NPDES Permit and to implement the strategy for long term solutions to the District's violations of its permit. DEIR at 2-7. However, the actual capacity of the equalization basin is far lower than that necessary to address overflow conditions that have caused the District to discharge untreated sewage into the Russian River. For example, the 1998 DEIR for the Facility Upgrades and Disposal Expansion Project for the RRCSD indicate that the amount of required equalization storage for the WWTP is 30.5 million gallons – or almost 9 times as much storage as is currently proposed.

The failure to address the fact that the proposed Project does not in fact meet the identified purpose and needs affects the adequacy of the DEIR throughout. For example, as discussed in more detail below, the DEIR does not adequately address potential impacts to water quality because it does not acknowledge that the facility is not sized to meet the asserted need. The inconsistency between the Project and its purpose and need also render the alternatives analysis inadequate. As detailed below, the DEIR does not include an adequate analysis of alternatives because it does not evaluate alternatives that provide increased storage capability necessary to address water quality violations from the WWTP without expanding treatment capacity to support new development.

The DEIR should therefore be revised to include an adequate description of the Project's purpose and need.

II. The District and the SCWA Have Improperly Segmented Their Environmental Review of the Project.

CEQA provides that an agency must evaluate the "*whole* of an action, which has a potential for resulting in a physical change in the environment. CEQA Guidelines § 15378(a) (emphasis added). Thus, where one approval implicates several other related actions that will have a significant impact on the environment, the agency must treat the actions as a single project and evaluate them in the same EIR. *Bozung v. Local Agency Formation Comm'n* (1975) 13 Cal.3d 263, 283-84 (CEQA mandates that "environmental considerations do not become submerged by chopping a large project into many little ones"); *San Joaquin Raptor/Wildlife Rescue Ctr v. County of Stanislaus* (1994) 27 Cal.App.4th 713, 729-35 (CEQA prohibits omission of project elements from environmental analysis); *Orinda Assoc. v. Bd. of Supervisors* (1986) 182 Cal.App.3d 1145, 1171-72 ("A public agency is not permitted to subdivide a single project into smaller individual subprojects in order to avoid the responsibility of considering the environmental impacts of the project as a whole."); *Arviv Enter., Inc. v. South Valley Area Planning Comm'n* (2002) 101 Cal.App.4th 1333, 1336 (EIR necessary to avoid segmenting review of five already built houses from sixteen other houses later proposed by the same party); *Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184, 1203-04 (environmental study of partially completed project required in part because it could compel additional mitigation and project modifications). P04-3

As indicated in RRWPC's comments on the NOP for this Project, the DEIR for the Russian River Irrigation Reliability and Beneficial Reuse Project ("irrigation project"), and the DSEIR for the Camp Meeker/Occidental Wastewater Reclamation project, this Project is clearly part of a larger plan to regionalize the Russian River Wastewater Treatment Plant ("WWTP"). As detailed in those comments, the Committee is concerned about the improper segmentation of the environmental review of a series of closely related activities that will expand the capacity of the WWTP. The RRCSD and SCWA have treated at least three of these projects – the irrigation project, the disinfection project, and the current Project – as a program to upgrade the WWTP and purported to analyze these projects in a single EIR. *See* RRCSD Facility Upgrades and Disposal Expansion Project Environmental Impact Report (May 4, 1998). RRCSD, however, has inexplicably decided to segment its review of these projects – all of which are clearly designed to achieve the same purpose. RRCSD and SCWA cannot adequately evaluate

the equalization project and the other wastewater treatment projects currently planned for western Sonoma County unless the EIR is based on a complete and accurate project description that properly defines and analyzes the proposed project.

As such, the Agencies must evaluate these proposed activities as a single project. This evaluation should look at the impacts of regionalizing the wastewater treatment system in the Guerneville/Occidental/Camp Meeker area and should evaluate a full range of alternatives to such a program. The DEIR claims that the cumulative impacts analysis addresses RRWPC's NOP comments regarding the improper segmentation of these projects. However, that cursory analysis does not satisfy CEQA's requirements for a comprehensive analysis of what is clearly a single project. As detailed in the case law cited above, until such a comprehensive analysis is prepared, the EIR cannot be adequate under the standards of CEQA.

P04-3 cont.

III. The DEIR Fails to Adequately Analyze and Mitigate The Significant Environmental Impacts of the Project.

CEQA requires that an EIR be detailed, complete, and reflect a good faith effort at full disclosure of a project's potentially significant environmental impacts. CEQA Guidelines § 15151. The document should provide a sufficient degree of analysis to inform the public about the proposed project's adverse environmental impacts and to allow decision-makers to make intelligent judgments. *Id.* Consistent with this requirement, the information regarding the project's impacts must be "painstakingly ferreted out." *Environmental Planning and Information Council of Western El Dorado County v. County of El Dorado*, 131 Cal.App.3d 350, 357 (1982) (finding an EIR for a general plan amendment inadequate where the document did not make clear the effect on the physical environment).

P04-4

Meaningful analysis of impacts effectuates one of CEQA's fundamental purposes: to "inform the public and responsible officials of the environmental consequences of their decisions before they are made." *Laurel Heights Improvement Ass'n v. Regents of the University of California*, 6 Cal.4th 1112, 1123 (1993) (*Laurel Heights II*). To accomplish this purpose, an EIR must contain facts *and* analysis, not just an agency's bare conclusions. *Citizens of Goleta Valley v. Board of Supervisors*, 52 Cal.3d 553, 568 (1990). Nor may an agency defer its assessment of important environmental impacts until after the project is approved. *Sundstrom v. County of Mendocino*, 202 Cal.App.3d 296, 306-07 (1988). An EIR's conclusions must be

supported by substantial evidence. *Laurel Heights Improvement Ass'n v. Regents of the University of California*, 47 Cal.3d 376, 409 (1988) (*Laurel Heights I*).

An EIR also "must include a description of the environment in the vicinity of the project, as it exists before the commencement of the project, from both a local and a regional perspective." CEQA Guidelines § 15125; *see also Environmental Planning and Info. Council v. County of El Dorado*, 131 Cal.App.3d 350, 354 (1982). As discussed in the letter submitted by Jane Nielson for the Sonoma Water Information Group, however, the DEIR fails to provide an accurate assessment of the geologic conditions affecting this Project. This failure to adequately describe the Project's environmental setting renders the DEIR inadequate under CEQA. *Friends of the Eel River v. Sonoma County Water Agency,* 108 Cal.App.4th 859 (2003). The failure to accurately characterize the geologic conditions also results in an inadequate analysis of potential impacts to ground and surface water quality. *See* CEQA Guidelines § 15125(a) (EIR's description of a project's environmental setting plays a crucial part in all of the subsequent parts of the EIR because it provides "the baseline physical conditions by which a lead agency determines whether an impact is significant.")

P04-4 cont.

For example, the comments of Dr. Nielson indicate that the DEIR does not properly recognize the potential for landslides and earth shaking that could affect the structural integrity of the equalization storage basin. See SWIG comments at pp. 2-3. As such, the DEIR fails to analyze the potential for leakage of untreated sewage from the Project or the rupturing of the storage basin and consequent discharge of untreated sewage to the Russian River. The DEIR must be revised to include an accurate description of the geologic conditions affecting the Project and an accurate analysis of potential impacts associated with these conditions. This revised DEIR must then be recirculated for public review and comment.

P04-5

The DEIR's analysis of water quality impacts is also inadequate. First, as detailed in the comments of Dr. Nielson the DEIR does not accurately characterize the depth to groundwater in the Project vicinity. SWIG Comments at pp. 3-4. As a result, the DEIR's conclusion that construction related impacts to groundwater will be insignificant (DEIR at p. 3.3-14) is not supported by the evidence. In addition, the failure to adequately characterize groundwater levels undermines the DEIR's conclusion (DEIR at p. 3.3-15) that operational impacts to groundwater will be less than significant. Instead of simply assuming that such impacts will be addressed during the design of the storage basin, the DEIR needs to accurately characterize groundwater levels now and provide

P04-6

appropriate mitigation measures now to address these potential impacts. *Sundstrom v. County of Mendocino*, 202 Cal.App.3d 296, 306-07 (1988).

The DEIR also fails to adequately analyze and mitigate potential impacts associated with failure of the storage basin by blithely assuming that these impacts will be insignificant. As discussed in the SWIG letter, however, because the DEIR does not accurately characterize geologic conditions, it does not take into account the true potential for failure of the storage basin and the resulting impacts to water quality. P04-6 cont.

Finally, the DEIR does not adequately address how the storage basin can be appropriately used to store fully and partially treated wastewater and untreated sewage. Unless the RRCSD/SCWA can ensure that all untreated sewage is removed prior to the introduction of treated wastewater, that untreated water could contaminate the whole system. The DEIR should at a minimum discuss whether it is possible to ensure that untreated wastewater does not contaminate treated water that may be stored by the Project. Therefore, the DEIR's analysis of water quality impacts must be revised and the DEIR recirculated for public review and comment. P04-7

IV. The DEIR Does Not Adequately Analyze the Growth Inducing Impacts of the Project.

CEQA requires that an EIR contain a "detailed analysis" of a proposed project's growth-inducing impacts. § 21100(b)(5). Growth-inducing impacts include aspects of the project that "may encourage and facilitate other activities that could significantly affect the environment." Guidelines § 15126.2(d). Thus, the DEIR must examine "the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly." *Id.* Likewise, CEQA requires analysis of the project's ability to "remove obstacles to population growth." *Id.*; *see also City of Antioch v. City Council of the City of Pittsburg*, 187 Cal.App.3d 1325, 1337 (1986) (CEQA requires that the DEIR analyze the impacts of the form, location and amount of development that it can reasonablely anticipate will be induced by the Project). P04-8

The DEIR fails to provide an adequate analysis of the potential for this Project to stimulate growth in the region. Although the basin itself may not be growth inducing (because it is not even large enough to accommodate the overflows that have occurred in the past), the basin is part of a larger plan to expand the treatment capacity of

the WWTP. As such, the RRCSD and SCWA must evaluate the potential for these upgrades to induce growth in the region.

P04-8 cont.

V. The DEIR Fails to Adequately Describe a Reasonable Range of Alternatives to the Proposed Project.

The alternatives section, along with the mitigation section, is the core of an EIR. *Citizens of Goleta Valley v. Board of Supervisors*, 52 Cal.3d 553, 564 (1990). Every EIR must describe a range of alternatives to a proposed project, and to its location, that would feasibly attain the project's basic objectives while avoiding or substantially lessening the project's significant impacts. Pub. Res. Code § 21100(b)(4); CEQA Guidelines § 15126(d). In preparing an EIR, the lead agency must ensure "that all reasonable alternatives to proposed projects are thoroughly assessed." *San Joaquin Raptor/Wildlife Rescue Center v. County of Stanislaus*, 27 Cal.App.4th 713, 717 (1994). An EIR's alternatives discussion must focus on alternatives that avoid or substantially lessen significant effects of the project. Guidelines § 15126.6(b); *Goleta Valley*, 52 Cal.3d at 556 (EIR must consider alternatives that offer "substantial environmental advantages."). The range must be sufficient "to permit a reasonable choice of alternatives so far as environmental aspects are concerned." *San Bernardino Valley Audubon Soc'y v. County of San Bernadino*, 155 Cal.App.3d 738, 750 (1984).

P04-9

The DEIR's analysis of alternatives fails to provide the information required by CEQA. In particular, the DEIR fails to include an analysis of an alternative that would address the purported purpose of the Project – to avoid overflow conditions that have occurred in the past. Although the DEIR does evaluate one alternative (Alternative B) that provides for somewhat increased overflow capacity, it does not address an alternative that comes even close to providing the 30 million gallons of storage that would have been required to avoid the 1998 overflow and discharge of sewage into the Russian River. In view of the description of the Project's need and purpose, an alternative meeting such demand should be included.

The DEIR also fails to identify an environmentally superior alternative. Although the DEIR implies that the No Project Alternative is environmentally superior, it does not actually reach this conclusion. This inability to identify an environmentally superior alternative (as required by CEQA) reflects the internal consistency between the project description and its purpose and need. Without a frank discussion of the Project's purpose and need and the Project's ability to meet these objectives, the neither the public

nor the RRCSD and SCWA decisionmakers can adequately weigh the costs and benefits of any particular alternative, including the Project.

P04-9 cont.

VI. The DEIR Should Be Redrafted and Recirculated.

CEQA requires recirculation of a revised draft EIR "[w]hen significant new information is added to an environmental impact report" after public review and comment on the earlier draft DEIR. Pub. Res. Code § 21092.1. The opportunity for meaningful public review of significant new information is essential "to test, assess, and evaluate the data and make an informed judgment as to the validity of the conclusions to be drawn therefrom." *Sutter Sensible Planning, Inc. v. Sutter County Board of Supervisors*, 122 Cal.App.3d 813, 822 (1981); *City of San Jose v. Great Oaks Water Co.*, 192 Cal.App.3d 1005, 1017 (1987). An agency cannot simply release a draft report "that hedges on important environmental issues while deferring a more detailed analysis to the final [EIR] that is insulated from public review." *Mountain Lion Coalition v. California Fish and Game Comm'n*, 214 Cal.App.3d 1043, 1053 (1989).

P04-10

In order to cure the panoply of DEIR defects identified in this letter, the District and SCWA will have to obtain substantial new information to adequately assess the proposed Project's environmental impacts, and to identify effective mitigation capable of alleviating the Project's significant impacts. In addition, as discussed above, this revised DEIR should be incorporated as a single document that evaluates all of the project alternatives and impacts. CEQA requires that the public have a meaningful opportunity to review and comment upon this significant new information in the form of a recirculated draft EIR.

VII. The Proposed Project Is Inconsistent with the County General Plan.

The 2020 Draft General Plan includes a specific policy calling for the preparation of "master plans or equivalent documentation for all wastewater management systems prior to approval of project facilities." Sonoma County General Plan 2020, Policy PF-1b. Neither the RRCSD nor the SCWA have adopted a master plan for improvements to the WWTP. Rather, the agencies have proposed piecemeal improvements to the system and are preparing separate EIRs for each individual activity. Before approving this Project or any of the other multiple proposals for the WWTP now under consideration, the RRCSD and SCWA should prepare a master plan for the WWTP, as required by the General Plan. Without such a master plan, this Project is not

P04-11

consistent with the General Plan. This inconsistency must be addressed in the DEIR and cured before the Project may be approved.

P04-11 cont.

Very truly yours,

SHUTE, MIHALY & WEINBERGER LLP

ELLISON FOLK

cc: Russian River Watershed Protection Committee

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OCT 2 2007

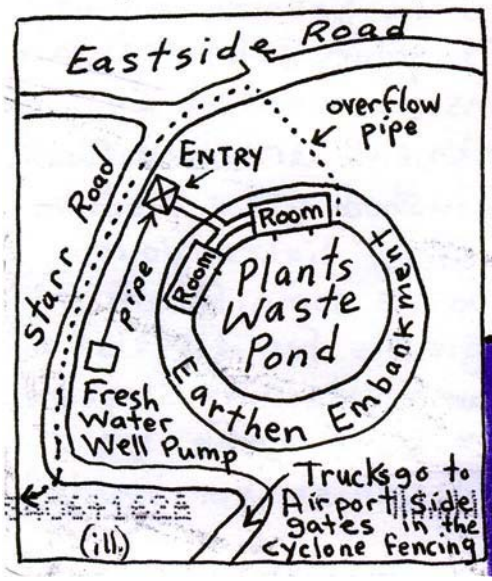
page one of two

Comment on Draft EIR for planned Neeley Road, Guerneville Wastewater Project: You have a design flaw in your projects already. Example: Above San Francisco in Sonoma County on Starr and Eastside Roads your subterranean set of hydroponic grow Rooms connected by tunnels under earthen embankment around a "waste water" pond of nitrogen rich Flushed grow medium used in cultivation under artificial lights your perennial coca and your papaver somniferum rootstocks for artichoke head grafts for disguise and manufacture of black tar opium containing strychnin. (See ill) Operators and guests enter the ⊠ Pump-Entry with Keys and vanish for hours.

P5-1

page two of two

Trucks hauling branches, saws, road signs, boxes, plant parts, logs, hoist items into Pump-Entry ☒. Unarmed Pedestrians on the public roadway are quickly noticed.



A guard parks at Fresh Water Pump Station, other guards in vehicles question and follow pedestrians. Your primary design flaw: Your Lack of Privacy.

Thanks.

From: Northrop Scientific Institute

To:

Mr. Church
P.O. Box 11628
Santa Rosa, CA
95406

SEP 13 2007

cont.
P5-1

P06

SHUTE, MIHALY & WEINBERGER LLP

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URBAN PLANNERS

November 27, 2007

Via Facsimile (707-544-6123) & U.S. Mail

Jeff Church
Sonoma County Water Agency
404 Aviation Boulevard
Santa Rosa, CA 95406

Re: Draft Environmental Impact Report for the Equalization Storage Basin Project

Dear Mr. Church:

This firm represents the Russian River Watershed Protection Committee ("RRWPC") on matters related to the environmental review for the Equalization Storage Basin Project (hereinafter referred to as "the Project"). RRWPC is dedicated to protecting the unique resources and rural community of the Russian River area. Enclosed with this letter is a copy of a peer review of the geology section of the draft environmental impact report ("DEIR") for the above referenced project.

Although the official comment period on DEIR has closed, responses to comments have not yet been released nor has the project been approved. Therefore, I request that the Agency respond to the comments included with this letter. In addition, pursuant to the holding in Galante Vineyards v. Monterey Penin. Water Mgmt. Dist., 60 Cal. App. 4th 1109, 1120-21 (1997), I request that this report be included in the administrative record on this project.

P06.1

Thank you for your consideration of these comments.

Very truly yours,

SHUTE, MIHALY & WEINBERGER LLP

Ellison Folk (PS)

ELLISON FOLK

cc: Russian River Watershed Protection Committee

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November 19, 2007

Jane E. Nielson, Ph.D.
President, Sebastopol Water Information Group
3727 Burnside Road
Sebastopol, CA 95472

Subject: **Geologic Peer Review, Russian River County Sanitation District Equalization Storage Basin Project**

Dear Dr. Nielson:

INTRODUCTION

In accordance with your request, I have reviewed the Draft Environmental Impact Report (DEIR) and consultant geotechnical reports for the proposed Russian River County Sanitation District Equalization Storage Basin Project. The proposed project is located southeast of the community of Guerneville, in unincorporated Sonoma County.

The purpose of the geologic peer review was to determine whether the potential impacts of the proposed project have been evaluated in accordance with State laws and standards of care that govern the practice of geology in the State of California.

The scope of the geologic peer review included the following tasks:

P06.2

1. Review of the referenced regional geologic and landslide maps of the site vicinity.

2. Review of the referenced geotechnical reports by Giblin Associates prepared in support of the project.

3. Preparation of this report that summarizes my findings.

A field reconnaissance was not performed as a part of this review because the stability of the slope that ascends northerly from the proposed project site is the most important geologic hazard affecting the proposed project. The stability of this slope has not been evaluated by any hazard expert, including the above

referenced Giblin Associates. The lack of geologic data bearing on this crucial slope leaves very little information for geologic peer review. When the ascending slope is actually evaluated by Giblin, a field reconnaissance to check that evaluation will be performed.

BACKGROUND INFORMATION

In approximately the last 40 to 50 years society in general and professional geologists in particular have learned a great deal about the negative impacts of geologic instability. Environmental degradation, property damage, personal injury and loss of life have occurred when geologic instability has impacted works of man. The professions of Engineering Geology and Geotechnical Engineering have learned valuable lessons from past mistakes and still are creating new solutions to a variety of stabilization issues.

Prior to 1970, the standards of care for the practice of geology were the responsibility of local jurisdictions and were very inconsistent. On June 30, 1970 the Geologist Registration Act became effective. From that time forward, professional geologists and various specialties within the profession of geology have been licensed by the State of California. Furthermore, various state, county and city agencies and various professional societies have developed requirements and guidelines for the practice of geology. The evolution of these requirements and guidelines has been incremental and is an ongoing process. cont. P06.2

Peer review is a process that compares a scientific work product to the laws, requirements and guidelines which govern the work in question. The reviewer must not have a bias for or against the particular project in question and its consultants. Opinions concerning the adequacy of the work product being reviewed must be based solely on a comparison of the work product to the governing laws, requirements and guidelines. Although Sonoma County does not require peer review before granting permits to projects on sites in unincorporated areas, counties and cities throughout California have required peer review of geologic reports written to guide proposed construction projects as an essential component of their permitting process since the 1960s.

These laws, requirements and guidelines have been set forth by the Geologist Registration Act of 1970, the Alquist-Priolo Earthquake Fault Zoning Act of 1972, the California Board for Geologists and Geophysicists, the California Mining and Geology Board, the California Geological Survey (CGS), formerly known as the California Division of Mines and Geology (CDMG), and various professional organizations like the Association of Engineering Geologists (AEG). Furthermore, these laws, requirements and guidelines exist whether or not local consultants follow them and whether or not local public agencies choose to enforce them.

OVERVIEW OF SLOPE STABILITY

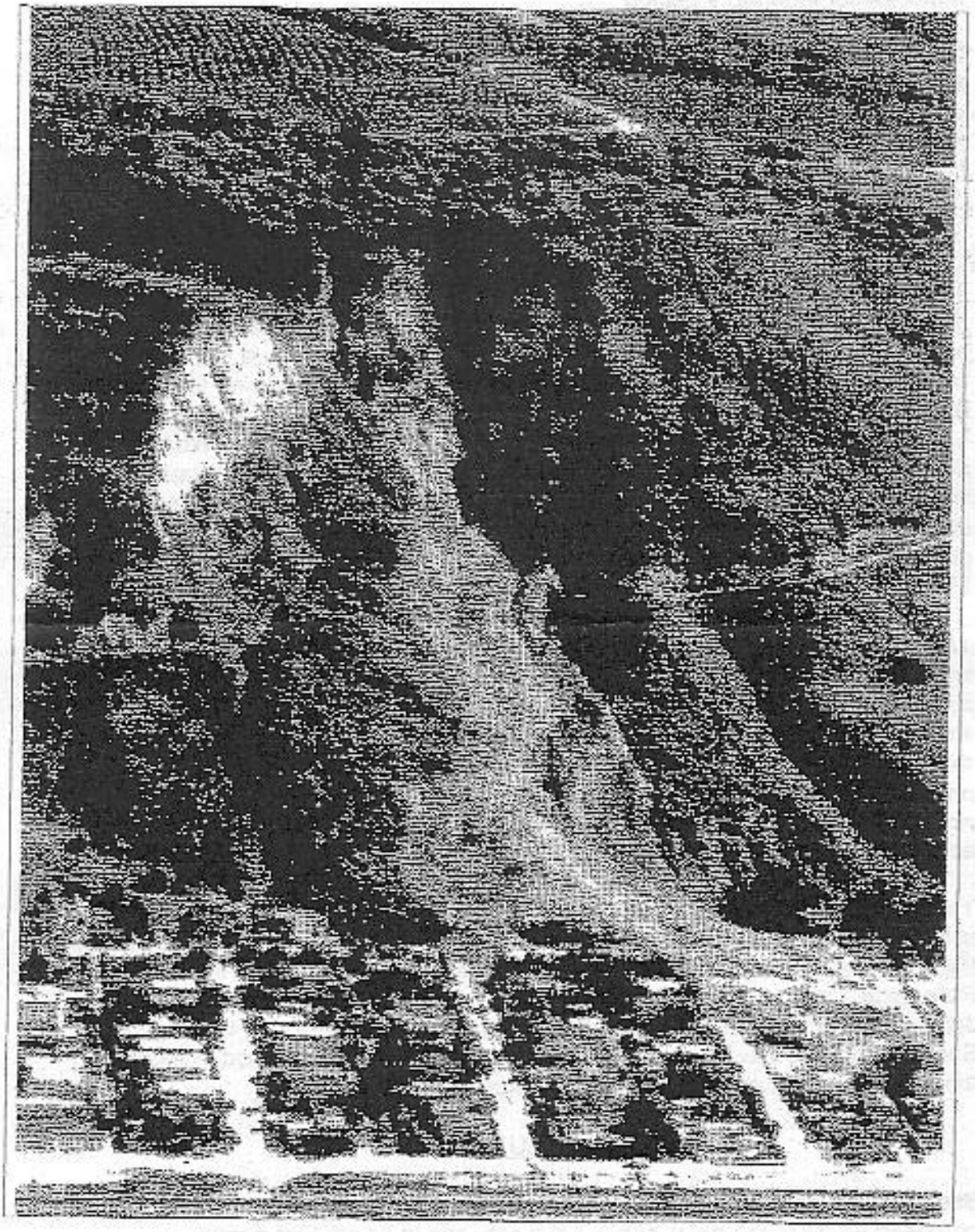
In the State of California, landslides are generally recognized hazards that receive media coverage on a fairly regular basis. Landslides have the potential to cause property damage, personal injury and loss of life where a structure is on or below, but in the path of, the landslide. To illustrate this, a photograph of the La Conchita landslide in Ventura County, California is presented in this report. While the victims of the destructive force of this landslide lived on nearly level ground, the landslide originated on an off site ascending slope and the destruction it caused is evident in the photograph.

An evaluation of the potential for any given slope or slopes to fail is called "Stability analysis". In simple terms, stability analysis is a scientific process in which the natural forces tending to cause slope failure ("Driving forces") are quantified and compared to the natural forces tending to resist slope failure ("Resisting forces") that are also quantified. The result of this comparison is a number that represents the "Factor of safety" against landsliding. A factor of safety less than one represents a slope in which the driving forces exceed the resisting forces and failure is actually occurring. A factor of safety of one represents a slope which is in an equilibrium condition where failure can be triggered by the slightest increase in driving forces and/or reduction in resisting forces. A factor of safety greater than one represents a slope that is in a stable condition. A higher numerical factor of safety represents a greater degree of slope stability. Additional information concerning stability analysis is presented in CDMG Special Publication 117, Guidelines For Evaluating And Mitigating Seismic Hazards in California, Reference 3. This is one of many documents that establishes the standard of care for the practice of geology in California that forms the basis for this peer review.

cont. P06.2

Stability analysis, like all other engineering work, recognizes that a margin of safety is required. For that reason, a factor of safety significantly greater than one has been the standard of care in the State of California for decades in siting various structures and in evaluating proposed changes in land use where slope failure has the potential to adversely affect the environment and/or the public health and safety. This standard of care exists whether or not local geotechnical practitioners choose to comply with it and whether or not local agency reviewers and building officials choose to enforce it.

In the case of the Russian River County Sanitation District equalization storage basin, such an analysis is needed to assess the potential effects of geologic instability in the immediately adjacent ascending slope north of the proposed project site. If the required factors of safety against deep seated and surficial instability do not exist, recommendations for mitigation must be prepared by the geotechnical consultant to protect the public health and safety and the



La Conchita Landslide, Ventura County, California

environment. This requirement exists without regard for the degree of difficulty and expense related to obtaining the necessary data and samples of subsurface materials for laboratory testing.

If mitigation of geologic instability affecting the proposed project cannot be accomplished for any reason, for example denial of access into off site areas for geologic subsurface investigation and/or corrective grading, costs exceeding budget constraints, environmental issues, etc, the project is not feasible and that fact must be acknowledged.

GIBLIN REPORTS

The Giblin reports provided for my review (See References) acknowledge, in general terms, some of the geologic hazards affecting the project site. These hazards include "...possible debris flow paths..." indicated by "...a partially buried chain-link fence and metal posts set in concrete that were snapped forward and leveled northeast of the mechanical building" (Reference 6). Reference 6 further states "We understand through conversations with facility personnel that during periods of heavy rainfall in 1992, a large debris flow occurred between the mechanical building and Clarifier No. 1, as shown on the attached Plate 2. We understand that the debris extended into the effluent storage reservoir." While unacceptably general, these statements do indicate that the County Sanitation District's Guerneville Sewage Treatment Plant site is not a safe site.

cont. P06.2

The Giblin reports provide no geologic map, no geologic data and no geologic cross sections depicting lithology and geologic structure in the off site northerly ascending natural slope. These are very serious deficiencies, based upon the standard of care for practice of geology in California, and render the Giblin reports inadequate to quantify the potential geologic hazards affecting the proposed project. Giblin geologists Brian F. Piazza and Michael S. Malone refused to take my phone calls on October 29, 2007 when I attempted to inquire about geologic map data and analysis of the off site ascending slope.

The geologic instability affecting the proposed project site is also documented in References 1 and 2. Reference 1 indicates the presence of large landslides in the natural slope that ascends northerly from the proposed project site. Reference 2 indicates that the northerly ascending slope is a "Principal predicted debris-flow source area". These maps prepared by the California Geological Survey and the United States Geological Survey cannot be ignored in assessing the geologic safety and feasibility of the proposed project.

CONCLUSIONS

Based on the forgoing regional and site specific information, it is clear that the proposed equalization basin site is not a safe site in its present condition. Without detailed geotechnical investigation and stability analysis of the northerly

ascending slope and preparation of recommendations to correct potential geologic hazards, the feasibility of the project is simply unknown.

All geotechnical work related to this site is subject to all existing laws and standards of care in the State of California, whether or not local public officials choose to enforce them. Assumptions and/or deferral until "later" of addressing geologic stability issues is unacceptable. It is also critically important to point out that geologic hazards exist independently of our ability to recognize them.

The potential consequences of geologic instability affecting the proposed project include property damage, personal injury, loss of life and environmental damage. It cannot be assumed that all geologic problems can be mitigated, no matter how severe. In order to demonstrate the geologic feasibility of the proposed project, the geotechnical consultant must adequately investigate the site itself and the northerly ascending slope. If adequate factors of safety against surficial and deep seated landsliding and debris flows cannot be demonstrated, the feasibility of mitigations must then be demonstrated. If mitigation of the geologic hazards is not feasible, the project is not feasible. cont. P06.2

Some geologic hazards simply cannot be mitigated. Examples are sites where the hazard originates off site and the off site property owner will not allow access for geotechnical investigation nor corrective grading, such as debris basin or buttress fill construction. Another example is a mitigation that would entail destruction of habitat or viewshed. The existence of a miraculous mitigation, to be determined at some future date, cannot be assumed. Furthermore, "Deep pockets" cannot solve all geologic problems.

I trust that the forgoing information fulfills your requirements at this time. If the project proponents provide additional geotechnical information in the future, it should be forwarded to this office for review.

The opportunity to be of professional service is sincerely appreciated. If you have any questions, please do not hesitate to call.

Very truly yours,

Raymond Waldbaum

Raymond Waldbaum
Registered Geologist 3142
Certified Engineering Geologist 923

CERTIFIED ENGINEERING GEOLOGIST
RAYMOND P. WALDBAUM
No. 923
STATE OF CALIFORNIA

REFERENCES

1. California Division of Mines and Geology Special Report 120, Geology For Planning In Sonoma County, 1980.

2. United States Geological Survey Open File Report 97-745E, Map Showing Principal Debris-Flow Source Areas In Sonoma County, California, 1997

3. CDMG Special Publication 117, Guidelines For Evaluating And Mitigating Seismic Hazards in California, 2000.

4. Giblin Associates, Report, Geotechnical Investigation, Russian River County Sanitation District Disposal Expansion Project, Guerneville, California, dated January 27, 1997.

5. Giblin Associates, Report, Soil Investigation, Proposed Equalization Pond and Aeration Facility - Study Area B, Russian River County Sanitation District Disposal Expansion Project, Guerneville, California, dated April 29, 1997.

6. Giblin Associates, Report, Geotechnical Investigation, Russian River Treatment Plant Expansion Project, Sonoma County, California, dated September 6, 2002.

7. Giblin Associates, Supplemental Report, Soil Engineering Consultation, Russian River Equalization Basin, Sonoma County, California, dated January 15, 2007.

CHAPTER 3.0

RESPONSES TO COMMENTS

CHAPTER 3.0
RESPONSES TO COMMENTS

The following responses have been prepared for each bracketed comment included in **Chapter 2.0** of this Response to Comments document.

LETTER A1: JOHN MAITLAND, SONOMA COUNTY TRANSPORTATION AND PUBLIC WORKS DEPARTMENT (SEPTEMBER 17, 2007)

RESPONSE A1-1.

Comment noted. As described under **Impact 3.7-1**, construction activities would require approximately 4,600 round-trip truck trips, or approximately 9,200 one-way truck trips. This would equate to 4,600 fully loaded trucks and 4,600 unloaded trucks along Neeley Road. This estimate takes into account the importation of fill for the earthen embankments of the basin, as well as importation of gravel to construct geopiers, use of material from geopier holes to construct banks, and exportation of approximately 8,000 cy of organic debris material. As described in **Impact 3.7-2** in the Draft EIR, potentially significant impacts to Neeley Road associated with construction traffic will be mitigated through implementation of **Mitigation Measure 3.7-2**. In response to comments, this mitigation measure has been revised to require that prior to commencement of construction activities, the District shall coordinate with the Sonoma County Transportation and Public Works Department (TPW) to ensure that necessary improvements and maintenance activities have been implemented along anticipated truck routes on Neeley Road. Please refer to the text revisions to **Mitigation Measure 3.7-2** in **Chapter 4.0** of this Response to Comments document.

LETTER A2: MIKE ZUMOT, CALIFORNIA DEPARTMENT OF WATER RESOURCES – DIVISION OF SAFETY OF DAMS (OCTOBER 2, 2007)

RESPONSE A2-1.

Comment noted. The proposed equalization basin is not subject to State jurisdiction for safety of dams.

LETTER A3: DENISE M. TSUJI, DEPARTMENT OF TOXIC SUBSTANCES CONTROL (SEPTEMBER 25, 2007)

RESPONSE A3-1.

Comment noted. The EDR report for the project area, which is included as **Appendix C** of the Draft EIR, provides the results of a regulatory database search of hazardous materials sites compiled by the federal

government, which meets CEQA standards. As discussed in the Initial Study included as **Appendix A** of the Draft EIR, the EDR report indicated one potential hazardous site of concern on the District property resulting from a 1995 release of diesel fuel from a punctured underground storage tank (UST). Remediation on the site consisted of the removal 230 cubic yards of contaminated soil and investigations to evaluate adverse impacts to beneficial uses of groundwater, including the installation of three groundwater-monitoring wells and collection of 15 soil borings in the vicinity and down gradient of the former UST. In August 2007, the Sonoma County Department of Health Services reviewed the case file for the leaking UST and submitted a recommendation for Case Closure to the North Coast Regional Water Quality Control Board (NCRWQCB) based on its determination that further monitoring, investigation, or remedial actions are not necessary to protect beneficial uses of groundwater. Recommended mitigation in the Initial Study (also listed in Table ES-1 of the Executive Summary) requires that the NCRWQCB be contacted to determine the appropriate course of action in the event contaminated soil or groundwater is encountered during construction activities.

RESPONSE A3-2

Comment noted.

LETTER A4: KATY SANCHEZ, CALIFORNIA NATIVE AMERICAN HERITAGE COMMISSION, (AUGUST 17, 2007)

RESPONSE A4-1.

Comment noted. Please refer to page 3.4-7 in **Section 3.4** of the Draft EIR for a discussion of cultural resource consultation.

LETTER P1: JANE E. NIELSON, SEBASTOPOL WATER INFORMATION GROUP (SWIG) (SEPTEMBER 24, 2007)

RESPONSE P1-1.

Comment noted. Specific comments concerning geological conditions and hazards within the project area are addressed in **Responses P1-2** through **P1-6** below, as well as a 2008 technical memorandum prepared by Giblin Associates included as **Attachment A** to this Response to Comments document. CEQA *Guidelines* Section 15147 provides the following guidance on the presentation of technical information within an EIR:

> The information contained in an EIR shall include summarized technical data, maps, plot plans, diagrams, and similar relevant information sufficient to permit full assessment of significant environmental impacts by reviewing agencies and members of the public. Placement of highly technical and specialized analysis and data in the body of an EIR should be avoided through inclusion of supporting information and analyses as appendices to the main body of the EIR.

In accordance with the above referenced guidelines, information presented in the Draft EIR provides an adequate level of detail to characterize the potential for adverse impacts resulting from the proposed project. Supporting technical information presented in the 1997 Soil Investigation Report, the 2002 Geotechnical Investigation Report, and 2007 Supplemental Report prepared by Giblin Associates was referenced within **Section 3.2**, Geological Resources, and was available for public review. In response to comments, these technical reports have been included as **Attachment B** to this Response to Comments document.

The spelling of Giblin Associates has been corrected in **Section 7.0** of the Draft EIR. Please refer to text revisions in **Chapter 4.0** of this Response to Comments document.

RESPONSE P1-2.

References to the Merced formation on page 3.2-1 have been deleted from the text. Please refer to text revisions to **Section 3.2.2** in **Chapter 4.0** of this Response to Comments document.

The Draft EIR preparers used information in the 1997 Soil Investigation Report, the 2002 Geotechnical Investigation Report, and 2007 Supplemental Report prepared by Giblin Associates to characterize geologic conditions on the project site and vicinity and support impact conclusions and recommended mitigation measures. The Draft EIR preparers appreciate the commenter's statement that the Giblin Associates site-specific reports were very thorough and accurate.

Use of the US Department of Agriculture (USDA) soil survey map to depict soil classifications on the project site and vicinity does not constitute negligence, lack of concern for adequacy, or intent to mislead readers who lack geological expertise. USDA maps are prepared by certified experts and are considered a highly reputable source of soil information. The Draft EIR used the generalized classification of "Yolo sandy loam" to characterize soil drainage, erosion potential, and runoff characteristics. In addition to discussing USDA soil classifications on the project site and vicinity, the Draft EIR summarized soils underlying the project footprint based on soil borings conducted by Giblin Associates. In accordance with CEQA Guidelines, a reference to the technical and specialized analysis contained in the 1997, 2002 and 2007 geotechnical reports prepared by Giblin Associates has been added to this section. Please refer to text revisions to **pages 3.2-2** and **3.2-6** of **Section 3.2.2** in **Chapter 4.0** of this Response to Comments document.

From an engineering geologic standpoint, the site's soils generally occur in two geologic units, colluvium and alluvium. The colluvial soils are a poorly sorted mixture of soil and rock fragments present on project area slopes. Included in this unit are soil deposits produced by slope erosion, debris flow, rock fall and landsliding. Colluvium is typically thickest where it accumulates near the base of slopes, within drainage swales and where steep hillside drainages outwash onto the gently sloping river terraces to form alluvial

fans. The alluvial soils include the relatively well-sorted waterlaid deposits of the Russian River. Alluvial soils underlie the gently sloping river terrace in the southern portion of the project site. Alluvium includes silt, sand, gravel and clay strata. The alluvium is interpreted to interfinger with colluvium in the middle portion of the basin footprint (**Attachment A**).

RESPONSE P1-3.

The comment implies that a potential exists for fault displacement and subsurface slippage to occur along shear zones within the highly deformed Franciscan Complex. In general, a possibility exists for fault displacement to occur along nearly any weakness in the earth's crust including ancient shear zones, old faults and even through unfaulted ground. However, the development of a new fault or reactivation of a long-inactive fault is relatively uncommon and generally not a concern in site development. In California, mitigation measures for fault surface rupture hazard are applied to active faults that have experienced displacement during the Holocene period (past 11,000 years) (**Attachment A**). The absence of active faults at the project site indicates that the potential for fault surface rupture and subsurface slippage is very low and does not constitute a significant adverse impact.

The impact discussion related to seismic events in the Draft EIR incorporated information and the findings of the 2002 and 2007 Giblin geotechnical reports, and explained that soils beneath the project site have the potential to result in liquefaction during a seismic event. Further discussion of the potential for lateral spreading of soils has been added to the discussion of liquefaction. Please refer to text revisions to **page 3.2-6** of **Section 3.2.2** and **Impact 3.2-2** in **Chapter 4.0** of this Response to Comments document.

As with any other facility or utilities system, the integrity of project components during seismic events cannot be guaranteed, but use of the highest feasible building standards would reduce potential impacts to less than significant. **Section 2.7.1** of the project description explains how the proposed ground modification system would reduce the potential for settlement and liquefaction in soils beneath the project site. As discussed therein, the system is a deep ground modification method that includes a series of drilled holes filled with compacted aggregate, increasing the density and strength of surrounding soils and decreasing potential settlement and liquefaction risk. The discussion under **Impact 3.2-2** has been revised to include further clarification of how this technique would reduce the potential for liquefaction and lateral spreading. Please refer to text revisions to **Impact 3.2.2** in **Chapter 4.0** of this Response to Comments document.

RESPONSE P1-4.

Section 3.2 of the Draft EIR described past major landslide events and the potential for future landslides on the project site and vicinity, including the 1998 event that resulted in 175 cubic yards of mud and debris being deposited within the wastewater treatment plant (WWTP) property. Additional detail has been added to disclose that other minor landslide events have also occurred within the project area,

organic materials discovered within the soils underlying the project site could be an indication of past debris flows, and that the site is located at the lower end of an alluvial fan. Additionally, the discussion of the potential for landslide events and debris flow under **Impact 3.2-2** has been expanded. Please refer to text changes to **page 3.2-6** of **Section 3.2.2** and **Impact 3.2-2** in **Chapter 4.0** of this Response to Comments document.

The referenced mitigations included within the 2002 Giblin Geotechnical Investigation Report were prepared for a separate, larger project and preceded construction of the existing retaining wall, or "debris wall," northeast and outside of the project area. The existing retaining wall was recommended by the 2002 Giblin Geotechnical Investigation Report and reduces the potential for damage to the facilities located on the eastside of the WWTP from upslope landslide hazards and/or debris flows. A two-story facility operations building is located between the area of the landslide and the location of the proposed equalization basin. As such, a debris flow originating in this drainage would not reach the equalization basin. Recommended mitigation to construction a berm around on-site structures is not applicable to this project since the elevated walls of the proposed equalization basin would function as berms to prevent debris flow from entering the basin cavity. A technical memorandum prepared by Giblin Associates in February 2008 (included as **Attachment A** to this Response to Comments document) identified a number of additional measures that would further reduce the potential for adverse effects resulting from debris flow hazards. These measures have been incorporated into the Draft EIR as mitigation. Please refer to text changes to **Mitigation Measure 3.2-2** in **Chapter 4.0** of this Response to Comments document.

RESPONSE P1-5.

Groundwater levels have been observed at a depth of approximately 5 to 13.5 feet below existing grade, and the bottom of the proposed basin would be located at or above the estimated groundwater elevation. Unusually high groundwater levels resulting either from prolonged or intense precipitation or river flooding could create a potential for buoyancy forces to adversely affect the equalization basin liner. **Impact 3.3-4** of the Draft EIR discusses the potential for damage to the basin liner from seasonal variations in groundwater levels resulting in groundwater elevations above the base level of the equalization basin bottom. As discussed therein, the potential for groundwater fluctuations and the impact on the reservoir liner would be reduced through design and control measures in the final engineering design as recommended in the 2005 Feasibility Study prepared by HDR.

It should be emphasized that the potential for damage to the basin liner would be expected to occur only when groundwater levels are higher than water levels in the basin. Because the purpose for the basin is to provide temporary storage during periods of high storm runoff, it is likely that the basin would be filled to a level above groundwater levels during periods of unusually high groundwater levels, resulting from either prolonged or intense precipitation or river flooding (**Attachment A**). Clarification has been provided in **Impact 3.3-4** of the Draft EIR. Please refer to text revisions to **Impact 3.3-4** in **Chapter 4.0** of this Response to Comments document.

RESPONSE P1-6.

Comment noted. Please refer to the specific responses above in **Response P1-2** through **Response P1-5.**

In response to the commenter's final bullet, the cost to maintain and monitor the proposed project would not be substantial, since the proposed basin is a static improvement and would be located on the WWTP property itself. Pursuant to CEQA requirements, the scope of environmental impact reports is limited to physical changes to the environment that could occur as a result of a project. Economic impacts are analyzed only to the extent that they would result in physical environmental consequences. It is not expected that the economic impacts of the Proposed Project would result in physical environmental changes. A general cost comparison of the alternative basin designs was provided in **Section 5.0** of the Draft EIR, Alternatives.

Section 2.7.1 of the Draft EIR explains that an impervious liner (such as polypropylene) would be installed on the interior slopes and the bottom of the basin. The liner material would be resistant to a wide range of chemicals found in wastewater and, with ultraviolet (UV) stability, would be appropriate for such an exposed application.

LETTER P2: KATHY AND ED SMITH (SEPTEMBER 17, 2007)

RESPONSE P2-1.

As described in **Impact 3.7-2** in the Draft EIR, potentially significant impacts to Neeley Road associated with construction traffic will be mitigated through implementation of **Mitigation Measure 3.7-2**. In response to the comments provided by the Sonoma County Transportation and Public Works Department (TPW, Comment Letter A1), this mitigation measure has been revised to require that prior to commencement of construction activities, the District shall execute an agreement with the TPW outlining responsibilities and timing for roadway repair prior to and after construction activities to ensure that the structural integrity of Neeley Road is maintained. Please refer to the summary of text revisions to **Mitigation Measure 3.7-2** in **Chapter 4.0** of this Response to Comments document.

The dirt road north of the WWTP that connects the property to Mays Canyon Road was considered as an alternative route for construction traffic. Due to the road's steep slopes and narrow access corridor, it was determined that the roadway would not be able to support construction traffic without substantial improvements and vegetation removal that could result in significant environmental impacts.

RESPONSE P2-2.

Please refer to **Section 2.6** of the Draft EIR, Purpose and Need for the Project. As discussed therein, the Proposed Project is needed to improve the ability of the WWTP to serve the District during periodic flood events, ensure compliance with the District's National Pollutant Discharge Elimination System (NPDES)

Permit (No. CA0024058), and to implement the strategy set forth in the long-term solutions report prepared by the District in response to the NCRWQCB's Cease and Desist Order 98-57 that identifies the need for increased equalization storage at the WWTP to address high winter inflows and flood related issues. The proposed equalization basin would strictly be utilized as a temporary storage unit under extenuating circumstances such as large storm events, periods of high influent flow, or during upset conditions of the treatment process at the plant. Construction of the equalization basin is necessary to accommodate existing conditions and would not increase the treatment or discharge capacity of the existing plant, or facilitate additional hook-ups. The potential for the project to facilitate expansion of the treatment capacity of the WWTP is discussed in more detail in **Section 4.1** and **Impact 4.2-9** of the Draft EIR.

Please contact the Sonoma County Permit and Resource Management Department (PRMD) to discuss the possibility of extending wastewater treatment services to the identified properties adjacent to the WWTP on Neeley Road. Refer to **Response P2-1** for a discussion of impacts to Neeley Road.

LETTER P3: BRENDA ADELMAN, RUSSIAN RIVER WATERSHED PROTECTION COMMITTEE (OCTOBER 1, 2007)

RESPONSE P3-1.

Comment noted. Comments submitted by Jane Nielson are responded to in **Responses P1-1** through **P1-6**, and comments submitted by Ellison Folk of Shute, Mihaly, and Weinberger LLP are responded to in **Responses P4-1** through **P4-11,** and **Responses P6-1** through **P6-2**.

Allegations of "regionalization" of the District are incorrect. The project is not part of a larger plan to regionalize the District's WWTP. The project is instead intended to prevent future water quality violations and protect the Russian River, as discussed in **Section 2.4** and **Section 2.6** of the Draft EIR. Nor has the project been improperly "segmented" from a single, larger project for purposes of CEQA review. The projects referenced by the comment are separate projects proposed to address different problems, and accomplish distinct goals and objectives. As a result, they are properly analyzed in different CEQA documents prepared by the proposing agencies. As CEQA *Guidelines* Section 15165 explains: "Where one project is one of several similar projects of a public agency, but is not deemed a part of a larger undertaking or a larger project, the agency may prepare one EIR for all projects, or one for each project, but shall in either case comment upon the cumulative effect."

As described in **Chapter 2.0** of the Draft EIR, the Proposed Project would implement the strategy set forth in the long-term solutions report prepared by the District in response to NCRWQCB Cease and Desist Order No. 98-57. The Proposed Project would provide temporary storage and help ensure NPDES Permit and Basin Plan compliance during winter months, when large storm events, periods of high influent flow, or upset conditions can affect the WWTP's treatment and disposal capabilities.

The District's UV Disinfection Upgrade Project (UV Project) was approved on September 11, 2007, as a distinct project. As explained in **Chapter 4.0** of the Draft EIR, the UV Project was not intended to comply with Cease and Desist Order No. 98-57 or implement the strategy set forth in the long-term solutions report, as is the Proposed Project. The UV Project instead replaced a chlorine disinfection system with a more advanced ultraviolet process, as required by the District's NPDES Permit. The commenter correctly notes at **Comment P03-3** that the District needed to implement the UV Project to prevent illegal discharges and avoid NCRWQCB penalties. The UV Project thus had a separate and independent utility, and was approved more than a year ago. It is not part of this project, and did not "regionalize" the WWTP.

The District proposed the Irrigation Reliability and Beneficial Reuse Project to comply with Cease and Desist Order No. 97-76 and increase the District's operational flexibility and reliability and ensure NPDES Permit and Basin Plan compliance during summer months (May 15 to September 30 of each year), when the Basin Plan prohibits discharges to the Russian River. By contrast, the Proposed Project would address a different Cease and Desist Order and a different set of problems that occur during different times of the year. Neither project is contingent on the other, nor part of any broader program of improvement or effort to "regionalize" wastewater treatment. The District's Board of Directors certified the Irrigation Reliability and Beneficial Reuse Project Final EIR on December 11, 2007, but did not approve a project. Instead, the District is working with the community to identify parcels that could accept tertiary-treated wastewater during the summer months without imposing significant costs to the ratepayers. The District's consideration of a future project is entirely independent of its decision on this Proposed Project, and the District may approve either project, in any configuration, without committing itself to ever approving the other. As a result, the two are separate projects under CEQA, and are properly analyzed in full, separate EIRs.

As explained in **Chapter 4.0** of the Draft EIR, the Camp Meeker/Occidental Wastewater Reclamation Project (WR Project) was not proposed by the District, but by two entirely separate legal entities, the Camp Meeker Recreation and Park District and the Occidental County Sanitation District, to address wastewater treatment and health hazard issues in those two communities. Those two entities prepared and circulated a Final EIR assessing the potential environmental effects of their project. The Camp Meeker Recreation and Park District declined to certify the Final EIR or approve a project analyzed therein, and withdrew itself from the process. The Occidental County Sanitation District Board of Directors certified the Final EIR on February 26, 2008 to stop the clock on still-accruing NCRWQCB civil penalties, but also did not approve a project. The Board instead directed staff to work with the Regional Board, community groups, and others to develop a cost-effective project addressing the District's ongoing wastewater treatment and health hazard issues. The WR Project was never a part of the Equalization Basin project, but was an entirely separate project proposed by different entities to address separate purposes and needs in different geographical locations.

The Proposed Project is thus a separate project with individual utility, and is not part of a single, larger project or any effort to "regionalize" the WWTP. As required by CEQA *Guidelines* Section 15165, **Chapter 4.0** of the Draft EIR nevertheless analyzes the cumulative effects resulting from the Proposed Project and 10 other reasonably foreseeable projects, including the three projects discussed above. The Draft EIR identifies the projects, analyzes both their short-term and long-term cumulative impacts, and identifies measures to mitigate all resulting impacts to a less-than-significant level. Much of this discussion appears to have gone above and beyond what CEQA requires, in light of subsequent decisions regarding some of the identified projects. This EIR nevertheless complies with CEQA by providing a full and complete analysis of all impacts of the Proposed Project, including its incremental effects in combination with the related effects of other past, present, and reasonably foreseeable future projects, and mitigating those impacts to the extent feasible.

RESPONSE P3-2.

The comment cites a portion of Policy PF-1b of the then-draft Sonoma County General Plan 2020. Section 2.2 of the Public Facilities and Services Element explains that Policy PF-1b "is intended to address issues regarding development of new wastewater systems and extension of sewer services to new areas not currently served." The Proposed Project is not a new wastewater system, and would not extend sewer services to new areas not current served. Policy PF-1b thus does not apply to the Proposed Project.

In addition, Policy PF-1b states only that the County shall "encourage" the preparation of master plans or equivalent documentation, and to consider measures if a master plan or monitoring shows inadequate facilities for planned growth. Section 2.4 of the Draft EIR explains that the Proposed Project would ensure NPDES Permit and Basin Plan compliance when processing existing flows and discharges. A master plan is not necessary to verify that the project would not result in significant impacts or inadequate facilities for planned growth.

Before developing a new wastewater system or extending sewer services to new areas, staff would seek direction from the Board of Directors regarding the advisability, time, and cost to ratepayers of developing a master plan and satisfying the eight separate minimum contents identified by Policy PF-1b.

RESPONSE P3-3.

Please refer to **Response P3-1**. **Impact 4.2-9** of the Draft EIR discusses the potential for cumulative growth-inducing impacts. As detailed therein, the District's UV Disinfection Upgrade Project was approved in September 2007 as a separate project and to meet a distinct purpose and need.

RESPONSE P3-4.

Comment noted. Project objectives and the purpose and need for the Proposed Project are discussed in **Sections 2.5** and **2.6** of the Draft EIR, respectively. Background information concerning the capacity of

the WWTP and previous flood events is discussed in **Section 2.4** of the Draft EIR. Compliance with the District's NPDES Permit as well as the response to Cease and Desist Order 98-57 both contribute to the District's need for temporary on-site storage.

RESPONSE P3-5.

Comment noted. Project objectives and the purpose and need for the Proposed Project are discussed in **Sections 2.5** and **2.6** of the Draft EIR, respectively. As discussed therein, the purpose and need for the Proposed Project does not include expanded capacity to accommodate additional hook-ups to the WWTP. As a result, this Draft EIR does not analyze the ability of the District to accommodate additional hook-ups. The design of the proposed basin would provide the maximum storage capacity possible for an earthen structure on the proposed site, taking into account the boundary of the WWTP property, site topography, basin elevation, and the configuration of the interior and exterior slopes. It is possible that additional on-site storage capacity could be achieved through the construction of an earthen basin with retaining wall, which was analyzed as Alternative B in **Section 5.0** of the Draft EIR, although this alternative would result in greater construction costs. The District does not dispute the need for additional equalization storage beyond that afforded by the Proposed Project. However, given the size and constraints of the District's WWTP property, this would require development of off-site storage facilities, which would likely result in greater environmental effects, prohibitive costs, and infeasible operation requirements (**Section 5.3.2** of the Draft EIR). At this time, the District could not acquire additional lands for the development of equalization storage without imposing significant additional costs on District ratepayers. It should be noted that development of the Proposed Project would not preclude the future development of off-site storage facilities should they become feasible in the future.

RESPONSE P3-6.

Please refer to **Response P1-4** for a discussion of the potential for impacts resulting from landslide events, and **Response P1-5** for a discussion of the potential for damage to the Basin liner as a result of fluctuations in groundwater levels.

RESPONSE P3-7.

Comment noted. **Section 2.7.3** and **Impact 3.3-3** of the Draft EIR describe the process for remediation of the basin following storage of untreated or partially treated wastewater. As described therein, following removal of untreated or partially treated wastewater from the basin, the basin would be re-filled with treated effluent from the plant, which would be drained and fully treated a second time before being discharged or used for recycled water irrigation. This process would ensure that any subsequent treated effluent stored in the basin pending discharge to the Russian River or recycled water irrigation would be fully treated prior to discharge or use for irrigation.

RESPONSE P3-8.

Please refer to **Response P3-5** for a discussion of the need for additional capacity beyond that afforded by the Proposed Project. The District agrees that the Proposed Project would help address peak flow periods, and will seek off-site storage facilities if feasible.

RESPONSE P3-9.

Comment noted. The reference to "untreated effluent" has been corrected to "untreated or partially treated wastewater." Please refer to text revisions to **Section 2.7.3** in **Chapter 4.0** of this Response to Comments document.

RESPONSE P3-10.

Refer to **Response P1-5** for a discussion of the potential for damage to the basin liner as a result of fluctuations in groundwater levels. As discussed therein, damage to the basin liner as a result of buoyancy forces from fluctuations in groundwater levels would be avoided through design and control measures in the final engineering design. Because these measures would prevent damage to the basin, the potential for impacts to groundwater quality would be avoided.

RESPONSE P3-11.

Comment noted. Please refer to **Response A1-1**.

RESPONSE P3-12.

Evapotranspiration is a collective term that includes both water discharged to the atmosphere as a result of evaporation from the soil and surface-water bodies and as a result of plant transpiration. The Proposed Project design does not allow for treated, partially treated, or raw wastewater to come in contact with surrounding soil or plant species.

Evaporation of compounds present in water stored in the basin would depend on the relative vapor pressure of those compounds. Storage of untreated wastewater in the basin would occur on a temporary emergency basis during periods of prolonged or intense precipitation or river flooding. Weather conditions during these periods would result in minimal evaporation rates. Additionally, relatively low concentrations of toxins present in the stored water, combined with dilution in the atmosphere and the distance to sensitive receptors, would ensure that impacts related to evaporation would be minimal and less than significant.

RESPONSE P3-13.

Current vector control techniques and protocols at the District's WWTP would also be applied to the proposed equalization basin facility. The project site falls under the jurisdiction of the Marin/Sonoma Mosquito and Vector Control District, located at 595 Helman Lane; Cotati, California 94931-9736.

RESPONSE P3-14.

Comment noted. Pursuant to CEQA requirements, the scope of environmental impact reports is limited to physical changes to the environment that could occur as a result of a project. Therefore, economic impacts are analyzed only to the extent that they would result in physical environmental consequences. As it is not expected that the economic impacts of the Proposed Project would result in physical environmental changes, a detailed cost analysis is not required for the environmental evaluation included within the scope of this EIR.

LETTER P4: ELLISON FOLK, SHUTE, MIHALY & WEINBERGER, (OCTOBER 2, 2007)

RESPONSE P4-1.

Comment noted. Neither the comments received on the Draft EIR nor the responses thereto indicate new significant impacts or significant new information that would require recirculation of the Draft EIR pursuant to CEQA *Guidelines* Section 15088.5.

RESPONSE P4-2.

Comment noted. The purpose and need, as well as the objectives of the Proposed Project are discussed in **Sections 2.5 and 2.6** of the Draft EIR, respectively. As discussed therein, the objectives of the Proposed Project are to improve the WWTP's ability to serve the District during periodic flood events that exceed the facility's treatment and disposal capacity in the most cost efficient manner through utilization of the District's existing resources. Nothing about the Proposed Project is "internally inconsistent" with these objectives, or the purpose and need of the Proposed Project. The long-term solutions report prepared by the District in response to Cease and Desist Order 98-57 identifies the need for increased equalization storage; it does not specify a minimum quantity of equalization storage. Neither the Cease and Desist Order nor CEQA prohibits the District from approving a project unless it would completely and permanently correct all potential problems, at whatever cost. The District agrees that increased equalization storage beyond that afforded by the Proposed Project would further improve its ability to prevent unpermitted discharges during large storm events. Please refer to **Response P3-5** for a discussion of consideration of increased storage capacity alternatives. Development of the Proposed Project would not preclude the future development of off-site storage facilities should these alternatives become feasible in the future.

RESPONSE P4-3.

The comment is incorrect. Please refer to **Response P3-1**. As explained therein, the projects identified by the commenter are not "clearly a single project" nor "clearly designed to achieve the same purpose". In fact, they are separate projects designed to address distinct purposes and needs. The Proposed Project would not "regionalize" the WWTP and, as noted in Comments P03-4 and P04-8, would not allow for increased capacity or growth.

RESPONSE P4-4.

Comment noted. Specific comments provided in the letter submitted by Jane Nielsen are addressed within **Responses P1-1 through P1-6**. The Draft EIR accurately describes existing geologic and other conditions.

RESPONSE P4-5.

Comment noted. Please refer to **Response P1-3** and **Response P1-4** for a discussion of the potential for impacts resulting from landslides and seismic events.

RESPONSE P4-6.

This comment is incorrect. The Draft EIR does not "blithely assum[e]" that any impacts would be less than significant. As stated in **Section 3.3.2** of the Draft EIR, groundwater levels have been observed at a depth of approximately 5 to 13.5 feet below existing grade. The bottom of the basin would be located at or above the estimated groundwater elevation. As recommended in the Feasibility Study for the Proposed Project (HDR, 2005), groundwater sampling will occur during the final design period of the storage basin to verify the appropriate design of the basin. Refer to **Response P1-5** for a discussion of the potential for damage to the basin liner as a result of fluctuations in groundwater levels. As discussed therein, damage to the basin liner as a result of buoyancy forces from fluctuations in groundwater levels would be avoided through design and control measures in the final engineering design.

RESPONSE P4-7.

Comment noted. Please refer to **Response P3-7**.

RESPONSE P4-8.

The comment is incorrect. As discussed in the Draft EIR and **Response P3-1**, the Proposed Project is not part of a larger plan to expand the WWTP's treatment capacity. Issues regarding potential growth-inducing and cumulative impacts are discussed in **Chapter 4.0** of the Draft EIR. The Draft EIR agrees with the commenter that the Proposed Project is not growth inducing in itself. As stated under **Impact 4.2-9** of the Draft EIR, because implementation of the Proposed Project would not facilitate additional

hookups, expand the service area, or otherwise induce growth, the project's contribution to impacts associated with growth inducement would not be cumulatively considerable.

RESPONSE P4-9.

Comment noted. In accordance with CEQA *Guidelines* Section 15126.6, **Chapter 5.0** of the Draft EIR considered a range of reasonable alternatives that could feasibly attain most of the basic objectives of the Proposed Project and would substantially lessen one or more of the projects significant environmental effects. In the process of identifying appropriate project alternatives, several options were considered but eliminated from further consideration due to their inability to achieve the basic objectives of the Proposed Project and/or reduce environmental effects, as discussed in **Section 5.3** of the Draft EIR. These alternatives included an increased capacity storage basin on the WWTP property and off-site storage alternatives. These alternatives were determined to be infeasible and eliminated from detailed consideration. CEQA *Guidelines* Section 15126.6(f)(3) states that "An EIR need not consider an alternative whose effect cannot be reasonably ascertained and whose implementation is remote and speculative." In addition to being infeasible, such alternatives would result in biological and other impacts, increased costs to ratepayers, and claims that the District is trying to "regionalize" the WWTP and induce growth.

The assessment of project alternatives presented in **Chapter 5.0** presents the detail necessary to present decision makers with a reasoned choice. This assessment focuses on the "comparative merits of the alternatives" with respect to the Proposed Project, as stipulated in CEQA *Guidelines* Section 15126.6(a). Conclusions of this analysis are summarized in **Table 5-1** and the environmentally superior alternative is identified in **Section 5.5.** It was determined that Alternative B, the earthen basin with retaining wall, is the environmentally superior alternative that meets the basic objectives of the Proposed Project as it would provide more storage capacity, further reducing the potential for impacts as a result of unpermitted discharges to the Russian River. However, this alternative would not have an appreciably lesser impact than the Proposed Project, since the potential effects of the latter can all be reduced to less than significant levels through the implementation of mitigation measures.

RESPONSE P4-10.

Neither the comments received on the Draft EIR nor the responses thereto indicate new significant impacts or significant new information that would require recirculation of the Draft EIR pursuant to CEQA *Guidelines* Section 15088.5.

RESPONSE P4-11.

Comment noted. Please see **Response P3-2**.

LETTER P5: NORTHROP SCIENTIFIC INSTITUTE (SEPTEMBER 13, 2007)

RESPONSE P5-1

Comment noted. The commenter's accusations concerning illegal activity are false.

LETTER P6: ELLISON FOLK, SHUTE, MIHALY & WEINBERGER, (NOVEMBER 27, 2007)

RESPONSE P6-1

Comment noted. The comment letter is addressed in **Response P6-2** below.

RESPONSE P6-2

Please see the February 2008 technical memorandum prepared by Giblin Associates included as **Attachment A** to this Response to Comments document for a detailed response to this comment letter. In summary, the deep-seated landslide depicted on published maps as possibly existing on the south slopes of Neeley Hill was evaluated by a Certified Engineering Geologist who concluded that the landslide did not exist and, as depicted, would not project into the proposed equalization basin site. The preparers of the technical memorandum concurred in this finding based on their own reconnaissance of the site and nearby slopes. Therefore, a slope stability analysis would be unwarranted. Mitigation measures recommended in the February 2008 memorandum have been incorporated into the EIR to further reduce the potential for adverse effects resulting from debris flow hazards. Please refer to text changes to **Section 3.2, Impact 3.2-2 and Mitigation Measure 3.2-2** of the Draft EIR in **Chapter 4.0** of this Response to Comments document.

The Draft EIR preparers agree that peer reviewers must not have a bias against a proposed project, participating consultants, or proposing agency. The commenter's statement that Sonoma County does not require peer review before granting permits is incorrect. The commenter's inclusion of a large photograph of the La Conchita landslide is unwarranted.

CHAPTER 4.0

TEXT REVISIONS TO THE DRAFT EIR

CHAPTER 4.0

TEXT REVISIONS TO THE DRAFT EIR

4.1 INTRODUCTION

The following corrections/edits have been preformed to the text of the Draft EIR since the public release in August of 2007. The corrections made by the EIR authors include: corrections that will improve the clarity of writing, grammatical errors, and consistency errors. Additional corrections or clarifications have been made based off requests by commentors, or an update to information based in the Draft EIR. Text that has been deleted from the EIR will be marked in this chapter as a strikeout (~~deleted text~~), while new text will be labeled with an underline (new text).

The changes that have been made are shown in a sequential order by which they appear in the Draft EIR.

4.2 TEXT REVISIONS

The first paragraph of **Section 2.7** on page 2-7 of the Draft EIR has been revised as follows:

> The Proposed Project would consist of the construction, operation, and maintenance of an earthen equalization basin and appurtenant structures within the existing boundaries of the WWTP (**Figure 2-5**). The proposed equalization basin would measure approximately 250 feet long and 150 feet wide, and include earthen embankments up to 30 feet high at the down slope end. Graded exterior slopes would be covered in riprap, erosion control blankets (such as jute mesh), or dense, deep-rooted ground cover. Interior slopes would be lined with an impervious material. The equalization basin would have a nominal capacity of 3.5 million gallons and, at that capacity, would require the importation of approximately 35~~2~~,000 cubic yards of earthen material for construction of the embankments and approximately 3,000 cubic yards of gravel for geopiers, and the exportation of approximately 8,000 cubic yards of excavated material. A pump station would be constructed adjacent to or within the equalization basin to pump the wastewater to the headworks (front end) of the treatment plant as treatment capacity becomes available or as upset conditions are resolved. Pumps would be located below grade inside a covered wet well and would have the capacity to drain the basin in one day.

Section 2.7.2 on page 2-9 of the Draft EIR has been revised as follows:

> Construction of the equalization basin would involve site clearing, excavation, earth movement, embankment construction, and hydro seeding. Approximately 3,000 cubic yards of soil would be excavated from the site. If suitable, this soil would be used to construct the basin's embankments. It is anticipated that organic debris found during geotechnical investigations would require the additional removal of approximately 8,000 cubic yards of material from the site, since this material would be unsuitable for embankment construction. Removal of excavated material would require approximately 800 ten yard truck trips (approximately 1,600 one-way trips). Completion of the levee would require importation of approximately 352,000 cubic yards of fill material. Transport of fill material would require an estimated 3,5200 ten-yard truck deliveries (approximately 7,000 one-way trips). Construction of the geopiers to stabilize the basin would require the importation of approximately 3,000 cubic yards of gravel. Importation of gravel to construct geopiers would require approximately 300 ten yard truck trips (approximately 600 one-way trips). Project construction would require relocation of various on-site pipes and utilities, including, but not limited to, raw sewage force mains, recycled water irrigation mains, and tertiary treated water outfall piping (**Figure 2-6**). The total number of trips required for import and export of materials for construction of the proposed project is estimated to be approximately 4,600 ten-yard truck round-trips (or approximately 9,200 one-way ten yard truck trips).

The second paragraph of **Section 2.7.3** on page 2-9 of the Draft EIR has been revised as follows:

2.7.3 OPERATIONS

During periods of high influent flow to the WWTP, the proposed equalization basin may be used for the temporary storage of untreated or partially treated wastewater~~effluent~~. Untreated or partially treated ~~effluent~~ wastewater would be diverted to the basin from Aeration Pond 3 when the plant reaches maximum treatment capacity. Untreated or partially treated ~~effluent~~ wastewater would be stored in the proposed basin on a temporary emergency basis. Upon resumption of normal operations, untreated ~~effluent~~ or partially treated wastewater would be sent back through the treatment plant for treatment and eventual disposal. Remediation of the proposed basin after the storage of untreated or partially treated~~effluent~~ wastewater would involve filling the basin with treated effluent from the WWTP, and then transferring this effluent back to the plant for re-treatment

Section 2.7.5 on page 2-11 of the Draft EIR has been revised as follows:

Construction of the equalization basin is projected to begin in late 2012~~2008 and last for approximately nine months~~. Construction would be limited to daytime hours between 7:00 A.M. and 7:00 P.M. The equalization basin would be operational in Winter 2013~~Fall 2008~~.

The discussion of "Geology" in **Section 3.2.2** on page 3.2-1 of the Draft EIR has been revised as follows:

> The project area is underlain ~~primarily~~ by the Franciscan ~~and Merced~~ formation~~s~~. The Franciscan formation underlies the Russian River basin. It is a heterogeneous[1] mass of sedimentary, volcanic, and metamorphic rocks, and is highly fractured and deformed by folding, faulting, and metamorphism[2]. The Franciscan formation is generally highly unstable, due largely to the presence of small to very large faults and shear zones[3]. It contains shale inter-bedded with more massive rocks, and serpentinite is common. It is widely unstable and erodible, resulting in common landslides, stream bank erosion, and soil creep. The Franciscan formation formed in the Jurassic-Cretaceous age approximately 60 to 150 million years ago (CGS, 2006a). ~~Many ridges in western Sonoma County, including the project site, are underlain by the Merced formation. This formation consists of coarse to fine marine sediment containing areas of clay, pebbles, and shells. The Merced formation overlays the Franciscan formation and was created in the Pliocene to early Pleistocene around 1.2 to 1.6 million years ago (Clifton et al., 1987).~~

The last paragraph of the discussion of "Soils" in **Section 3.2.2** on page 3.2-2 of the Draft EIR has been modified as follows:

> Test borings ~~of soils underlying the project footprint~~ were undertaken to evaluate the depth and nature of underlying soils and material at the proposed project site. The detailed results of these borings are presented in **Attachment B** to the Final EIR. The borings indicate~~d~~s low to moderate strength to a depth of approximately 30 feet below ground surface. Consolidation testing indicate~~d~~s that the soils would be subject to significant settlement under the stress of new loads or fills. Furthermore, organic debris was observed in several of the test borings with depths up to 20 feet (Giblin Associates, 2007~~6~~).

The discussion of "Liquefaction" in **Section 3.2.2** on page 3.2-6 of the Draft EIR has been modified as follows:

> *Liquefaction and Lateral Spreading*
>
> When subjected to energy associated with the shaking intensity of a considerably sized earthquake (MMI VIII and above), certain soils when saturated with water may lose their solid structure and act as liquids. Ground subject to liquefaction may sink or pull apart. Soils comprised of sand and sandy loams, in areas with high groundwater tables or rainfall, are subject to liquefaction during intense seismic shaking events. According to the Association of Bay Area

[1] Heterogeneuos refers to a varied composition or mixture of elements.
[2] Metamorphism is the process by which pressure and temperature alter the mineral content, chemical composition, and structure of solid rock.
[3] A shear zone is an area of weakness, similar to a fault, but consisting of several parallel displacement zones usually over a greater width than a single fault.

Governments (ABAG), the project site has a very high potential for liquefaction to occur during these strong seismic events. Test borings of the soil underlying the project footprint substantiated this classification of the site. The test borings indicated loose, sandy soils are located underneath the project footprint, and groundwater was encountered at 7 feet below ground surface (Giblin Associates, 2007~~6~~). Strong ground shaking on sites with slopes can also result in lateral spreading and soil lurching, which is essentially a horizontal slumping of soils generally downslope.

The discussion of "Landslides" in **Section 3.2.2** on page 3.2-6 of the Draft EIR has been modified as follows:

LANDSLIDES

Landslides occur in Sonoma County during episodes of high-intensity, long-duration rain events in areas that have steep slopes, and weak soils devoid of vegetation. Due to the weak and deformed nature of the Franciscan rocks in the project area; the Coast Range is prone to deep weathering and development of thick overlying soils. These thick soils create excess weight, especially when wet, and are prone to landslides. In 1998, a substantial landslide destroyed several homes and forced the evacuation of 130 homes in Rio Nido, which is located approximately 3 miles northeast of the District's treatment plant. In the same year, a mudslide originating on private property north of the WWTP deposited approximately 175 cubic yards of mud and debris within the WWTP property. This mudslide was caused by the large flood event discussed in **Section 2.4** that forced the District to discharge untreated wastewater to the Russian River, resulting in Cease and Desist Order 98-57. The District has evaluated the area where the landslide occurred on the WWTP property for potential damage and constructed a small retaining wall to shield the facilities from future potential debris flows (~~HDR~~Giblin, ~~2005~~2002). This area is located on the ~~western~~ eastern side of the WWTP, northeast and outside of the proposed location for the equalization basin.

The WWTP property has also experienced a number of small debris flows that affected access roads and an effluent storage pond located east of the current project site. In 2006, heavy rains caused a debris flow that washed 5 to 6 feet of material on to the WWTP property and a minor landslide on Neeley Road. Test borings on the project site indicate the presence of organic materials that may be the result of an organic debris pit, or evidence of past debris flows. A relatively steep, seasonal drainage ascends the south slopes of Neeley Hill north of the proposed equalization basin location. Upslope from the WWTP's main access road is a narrow drainage that is bound by steep slopes and filled with colluvium containing numerous boulders and cobbles. At the project site, the colluvium is significantly less coarse and is composed predominantly of gravel, sand and silt. The composition of the colluvium, the configuration of the topography at the pond site, and the history of small debris flows in the project vicinity indicate

that the north end of the proposed pond is located at the lower end of an alluvial fan. The fan was apparently formed by sediment from both debris flow and sediment-laden runoff outwashing from the drainage (**Attachment A** of the Final EIR).

Impact 3.2-2 in **Section 3.2.4** on pages 3.2-11 and 3.2-12 of the Draft EIR has been revised as follows:

Impact

3.2-2 Implementation of the Proposed Project would expose structures to seismic hazards and geologic resources that may be adversely impacted by seismic events. Less than Significant with Mitigation.

Surface Rupture
The project site is more than 8 miles from the nearest active fault identified in conjunction with the Alquist-Priolo Earthquake Fault Zoning Act. The Proposed Project is thus unlikely to be affected by surface rupture and would not increase risks of surface fault rupture. This impact is ***less than significant***.

Seismic Ground Shaking and Ground Failure
The project could be subject to adverse effects from seismic events. Numerous active and potentially active faults are within 20 miles of the project site. Movement along one or more of these faults is likely to create ground shaking on the project site. In a 50-year period, USGS models of seismic hazard predict a 10 percent chance of ground shaking to be greater than 0.4g. As noted in **Section 3.2.2**, the soil underlying the project footprint has the potential to experience liquefaction or lateral spreading during episodes of significant seismic ground shaking intensity.

However, the equalization basin has been designed to withstand the effects of expected seismic events. Geotechnical measures recommended as part of geotechnical investigation reports (**Attachment B** of the Final EIR) to reduce the potential for serious damage to structures from strong earthquake ground motions (not related to liquefaction) would be incorporated into the project design. These measures include grading techniques such as removing weak highly compressible soils and replacing them with properly compacted fill, constructing embankments at appropriate slope inclinations, proper placement and compaction of fill, and subdrainage to prevent excessive pore pressures beneath fills and buttresses. In addition, estimated peak ground accelerations with a probability of exceedance of 10 percent in 50 and 100 years have been provided to support the structural engineering design of the project.

As discussed in **Section 2.7.1**, the Proposed Project would likely include the installation of an impact intermediate foundation system or similar reinforcement mechanism. ~~These~~

~~systems improve structural performance during seismic events over conventional foundation methods. Furthermore, the system~~ that acts as a deep ground treatment reducing the potential for liquefaction and lateral spreading during seismic events. Deep ground modification techniques improve structural performance during seismic events over conventional foundation methods through reinforcement of poor soils, including loose sands, silts, mixed soil layers, uncontrolled fill and soils below the ground water table. Specifically, the impact intermediate foundation system uses densely compacted sections of crushed rock in a 2 to 3 foot diameter cavity of varying depth. The crushed rock is rammed into place, increasing the lateral stress handling capabilities and improving the soil characters surrounding the impact intermediate foundation system, and resulting in better foundation settlement control and greater bearing pressures for the basin. Additionally, as a standard measure discussed in **Section 2.7.4**, an emergency response plan would be developed that would identify standard procedures in the event of a seismic event causing substantial damage to the equalization basin. Through project design elements that would improve structural performance during seismic events and the preparation of an emergency plan, potential impacts associated with failure of the equalization basin would be considered ***less than significant***.

Landslides

~~Although t~~The project ~~site is surrounded by an~~ area ~~with the~~has a potential for landslides as evidenced by past debris flow events on the WWTP property. ~~, the~~ To address this potential hazard, the District ~~has~~ evaluated the site of the 1998 landslide for potential damage ~~from~~ that could occur from future landslides and constructed a retaining wall designed to shield the facilities from potential debris flows originating from the same area as the 1998 landslide, which represents the most significant landslide event on the District's property. This area is located north of the clarifiers, northeast and outside of the proposed project site. This retaining wall would reduce the potential for landslides on upslope hills to enter the treatment plant facilities. A two-story facility operations building is located between the area of the landslide and the location of the proposed equalization basin. As such, a debris flow originating in this drainage would not reach the equalization basin. Additionally, the earthen embankments of the equalization basin are designed to be approximately 5 feet tall on the upslope side of the basin, and would function as a berm or barrier preventing minor debris flows from entering the basin cavity and displacing stored treated effluent or sewage. After incorporation of the recommended mitigation measures, ~~T~~this impact would be reduced to ~~is~~ ***less than significant***.

Mitigation Measure

~~None required.~~

3.2-2 The District shall implement the following measures to reduce the debris-flow hazard to the project:

- Construct drainage improvements to the access road that ascends the south side of Neeley Hill to prevent roadway runoff from entering the drainage that affects the project area.
- Construct debris catchment structures that would intercept debris before it reaches the basin and/or plant access road. Catchment shall be accomplished utilizing debris fences, retaining walls or soil and/or rock berms located in a manner that would intercept and retain sediment. Equipment access to the catchment structures shall be provided to facilitate periodic debris removal and maintenance.
- Construct debris-flow deflection structures in a manner that redirects runoff and sediment around the equalization basin. This shall be accomplished utilizing earthen berms that are part of the equalization basin design. A well defined debris pathway or runout channel shall be provided for debris diverted along the east side of the equalization basin embankment that redirects debris away from other site facilities.

Impact 3.3-4 in **Section 3.3** on pages 3.3-15 and 3.3-16 of the Draft EIR has been revised as follows:

Impact

3.3-4 During operation of the Proposed Project, seasonal variations in groundwater levels could result in groundwater elevations above the base level of the equalization basin bottom. The pressure of groundwater on the basin liner could compromise the structural integrity of the reservoir, resulting in co-mingling of treated, partially treated, or untreated wastewater with groundwater. Less than Significant.

The storage of untreated, partially treated, or treated wastewater in the equalization basin could contaminate groundwater resources if high groundwater seeps into the basin, or if wastewater seeps into the groundwater table through the soil of the earthen equalization basin. As described in the project description, the earthen basin would be lined with an impermeable liner material, such as polypropylene. Average groundwater levels would be below the bottom of the proposed basin. Under normal conditions, the liner would prevent co-mingling between groundwater and wastewater, and no impacts to groundwater would occur. However, unusually high groundwater levels above the depth of the basin liner resulting either from prolonged or intense precipitation or river flooding could create a potential for buoyancy forces to result in structural damage to the equalization basin liner. It should be noted that buoyancy forces would only be expected in the anomalous situation when groundwater levels rise above the levels of effluent being stored in the basin. ~~In the anomalous situation that groundwater levels rise above the depth of the liner, structural damage could occur to the liner.~~ ~~Groundwater pressure~~

~~could build until the liner fails and co-mingling of wastewater and groundwater occurs.~~ Nevertheless, the potential for groundwater fluctuations and the resulting effect on the reservoir liner ~~would~~ shall be considered in the final engineering design of the equalization basin. As described in the feasibility study (HDR, 2005) and **Attachment A** of the Final EIR, the final engineering design shall include design features and controls that eliminate the potential for structural damage to the liner from anomalous groundwater fluctuations. These design features and controls shall include a specific schedule for monitoring of groundwater levels, and pressure-relief valves and perimeter drainage trenches to decrease hydrostatic pressure. Additional design features may be incorporated into the final design if necessary to meet the standard identified above, i.e. the elimination of the potential for structural damage to the liner. The inclusion of such measures constitutes standard engineering practice, and was contemplated and intended as part of the first feasibility study. Therefore, this impact is considered ***less than significant***.

~~Specific designs and controls would be implemented that would eliminate the potential for damage to the basin liner. Potential design features that could be employed to reduce adverse effects of high groundwater include drainage blankets beneath the basin liner, perimeter pumps to temporarily decrease hydrostatic pressure, perimeter drainage trenches, and a specific schedule for monitoring of groundwater levels. These design features are standard engineering practice. and will be incorporated into the final design. Therefore, this impact is considered ***less than significant***.~~

Impact 4.7.1 on page 3.7-5 of the Draft EIR has been corrected to read:

Impact

~~4.7.1~~3.7-1 During construction of the Proposed Project, large vehicle traffic would increase compared to the existing traffic load on SR-116 and Neeley Road. The temporary increase in traffic on Neeley Road ~~C~~could result in inadequate private, public, and municipal access to the surrounding community. Less than Significant with Mitigation.

Impact 4.7.2 and **Mitigation Measure 3.7-2** in **Section 3.7** on pages 3.7-6 and 3.7-7 of the Draft EIR have been revised as follows:

Impact

~~4.7.2~~ 3.7-2 The temporary increase in large vehicle traffic related to construction activities of the Proposed Project could result in accelerated deterioration of portions of Neeley Road. Less than Significant with Mitigation.

The Proposed Project would not change the design of existing roadways and does not include any operational features that would impact traffic or increase hazards. However, large truck traffic associated with the import and export of material for the construction of the basin could accelerate the deterioration of the roadway surface due to the high number of trips. It is projected that during the construction period, approximately 46 round-trip truck trips per day (92 one-way) would be required for the import of materials Monday through Friday for a period of approximately 20 weeks. This would result in a total of 4,600 round-trip truck trips for the project (9,200 one way). Further deterioration of Neeley Road could result in safety hazards due to the already poor conditions of this roadway. Additionally, an existing timber deck viaduct limited to legal loads may not be able to withstand the amount of truck traffic generated by project construction. This is considered a ***potentially significant*** impact.

Mitigation Measure

3.7-2a Implement Mitigation Measure 3.7-1e.

3.7-2b The District shall maintain the roadway to meet all Sonoma County Transportation and Public Works Department (TPW) safety standards during construction. The District and TPW shall execute an agreement prior to commencement of construction activities outlining roadway repair measures and traffic control measures to avoid structural damage to the timber deck viaduct. These measures shall include, but are not limited to the following:

- A minimum of 20′ of roadways shall be cleared of brush and tree limbs for trucks.
- Centerline striping shall be placed prior to commencement of work and replaced after placement of an asphalt concrete overlay.
- One lane traffic control system at viaduct crossing.
- Asphalt construction repairs to maintain Neeley Road during construction.
- Asphalt concrete overlay along portions of Neeley Road damaged by the project prior to the winter season following construction.

3.7-2c Construction traffic over Neeley Road will be limited to June 1 through October 15 to avoid operating over saturated pavements, unless dry conditions exist such that construction traffic would result in no damage to the roadway. No construction traffic will use Neeley Road before June 1 or after October 15 without approval from TPW, the agency with jurisdiction over Neeley Road.

Significance After Mitigation

Implementation of recommended mitigation measures would ensure compliance with regulations intended to minimize adverse impacts to roadways. Additionally, recommended mitigation would ensure that roadway repair and traffic control measures would be in place to prevent potentially hazardous roadway conditions and structural damage to the timber deck viaduct. Therefore, after mitigation, potential impacts associated with deterioration of Neeley Road would be ***less than significant***.

The discussion of short-term cumulative traffic related impacts in **Section 4.2.2** on page 4-8 of the Draft EIR has been revised as follows:

Traffic

Concurrent development of the Proposed Project and other relevant projects identified in **Table 4.2-1** would temporarily increase traffic on local roadways, thereby increasing potential safety hazards and design stress. Construction-related traffic impacts from the Proposed Project would occur primarily along Neeley Road, the primary access road to the WWTP. The UV Disinfection Project, IRBR Project and WR Project would have similar impacts on Neeley Road during their construction phases. Concurrent development could cause cumulatively significant impacts along Neeley Road. Implementation of **Mitigation Measure 3.7-1**, however, would reduce potential impacts associated with construction related traffic from the Proposed Project by requiring coordination with public transportation and emergency service providers, and ensuring construction traffic would comply with California Vehicle Code Sections relating to vehicle width and height. Additionally, construction traffic would be limited to non-peak hour traffic times to the extent feasible. Similar mitigation measures would also be required for the UV Disinfection Project, IRBU Project and WR Project. Additionally, an existing timber deck viaduct on Neeley Road may not be able to withstand the amount of truck traffic generated by project construction in combination with cumulative developments. **Mitigation Measure 3.7-2** would require the District and Sonoma County Transportation and Public Works Department (TPW) to execute an agreement prior to commencement of construction activities outlining roadway repair measures and traffic control measures to avoid structural damage to the timber deck viaduct and to ensure TPW safety standards are met during construction. As such, the project's contribution to cumulative traffic related impacts from construction activities would not be considerable.

The fourth sentence relating to air quality impacts on page 4-9 in **Section 4.2.2** of the Draft EIR has been revised as follows:

Mitigation Measure ~~4.8-1~~3.8-1 has been recommended for the Proposed Project to reduce potential air quality impacts associated with criteria air pollutant emissions to less than significant levels.

Mitigation Measure 4.2-1 in **Section 4.2.2** on page 4-9 of the Draft EIR has been revised as follows:

Mitigation Measures

4.2-1 Implement the following mitigation measures identified in Chapter 4.0 of this EIR:

- Water Resources, **Mitigation Measure 3.3-1**
- Biological Resources, **Mitigation Measures 3.5-2**, **3.5-4**, **3.5-5**, and **3.5-6**
- Noise, **Mitigation Measure 3.6-1**
- Traffic, **Mitigation Measures 3.7-1** and **3.7-2**
- Air Quality, **Mitigation Measures 3.8-1**

Impact 4.2-2 and **Mitigation Measure 4.2-2** in **Section 4.2.2** on page 4-9 and 4-10 has been revised as follows:

Impact

4.2-2 The Proposed Project, along with implementation of additional wastewater and water resource projects, could lead to long term impacts associated with upset conditions from structural damage or collapse of facilities resulting from ground shaking or surface fault rupture during major earthquakes on nearby active faults. Less than Significant with Mitigation.

Failure of slopes and settlement could occur beneath proposed facilities at the WWTP site and other project areas, resulting in structural or mechanical damage and secondary effects related to water release. The Proposed Project would result in the development of an earthen equalization basin that could potentially be impacted during a seismic event. Implementation of the UV Disinfection Project, IRBR Project and WR Project would also result in the development of facilities that could result in upset conditions during a seismic event. Failure of these facilities could result in a significant release of untreated and treated wastewater into the Russian River watershed.

The Proposed Project would be required to comply with design measures established by the American Water Works Association (AWWA) for treatment and conveyance infrastructure design and construction. Moreover, as described in **Section 2.7.1**, the Proposed Project includes the installation of an impact intermediate foundation system to improve the structural performance of the equalization basin during seismic events. Additionally, as described in **Section 2.7.4,** the District would prepare an emergency response plan for failure of the proposed facilities at the WWTP during a seismic event.

Compliance with standard design practices established by the AWWA and implementation of ~~recommended m~~**Mitigation ~~m~~Measures~~s~~ 3.2-2** would reduce impacts associated with upset conditions resulting from ground-shaking or seismic events to a less than cumulatively considerable level. Therefore, the project's contribution to this impact would not be cumulatively considerable.

Mitigation Measure

~~None required.~~

4.2-2 Implement **Mitigation Measure 3.2-2**.

The discussion of traffic related impacts resulting from Alternative B in **Section 5.4.2** on page 5-10 of the Draft EIR has been revised as follows:

Traffic

Construction activities associated with Alternative B would generate traffic that could result in short-term impacts to residences, businesses and public service providers along Neeley Road. Additionally, construction related traffic could accelerate the deterioration of roadway conditions along Neeley Road. The amount of construction related traffic generated by Alternative B would be similar to the Proposed Project~~, as the importation of fill material under Alternative B would require 3,300 truck deliveries, which is approximately 100 more than the Proposed Project. This difference is considered marginal and would not significantly affect the level of impacts resulting from construction related traffic~~. Therefore, because a similar amount of construction related traffic would occur under Alternative B, a *similar level* of traffic related impacts would occur under this alternative when compared to the Proposed Project.

The following reference in **Section 7.0** on page 7-3 of the Draft EIR has been revised as follows.

~~Gibblon~~ Giblin Associates, 200~~7~~6. ~~Preliminary~~Supplemental Report, Soil Engineering Consultation, Russian River Equalization Basin, Sonoma County, California. Prepared for Sonoma County Water Agency. January 15, 2007.

The following references have been added to **Section 7.0** of the Draft EIR:

Giblin Associates, 1997. Soil Investigation Report, Proposed Equalization Pond and Aeration Facility – Study Area B, Russian River County Sanitation District Disposal Expansion Project, Guerneville, California. Prepared for Sonoma County Water Agency. April 29, 1997.

Giblin Associates, 2002. Geotechnical Investigation Report, Russian River Treatment Plant Expansion Project, Sonoma County, California. Prepared for Sonoma County Water Agency. September 6, 2002.

ATTACHMENT A

RESPONSE TO COMMENTS TECHNICAL MEMORANDUM (GIBLIN ASSOCIATES, FEBRUARY 2008)

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February 26, 2008

Job No. 205.7.3-3

Proj/ RUSSIAN RIVER CSD EQUALIZATION BASIN STORAGE PROJECT DEIR (Prelim.)
70-13-7 #___
Giblin Associates TW# 06/04-80

Sonoma County Water Agency
P.O. Box 11628
Santa Rosa, California 95406
Attention: Mr. Dale Roberts

Subject: Response to Comments from:
- Sebastopol Water Information Group (SWiG)
- Mr. Ray Waldbaum

Russian River Equalization Basin DEIR
Sonoma County, California

This letter provides our response to comments provided by the Sebastopol Water Information Group (SWiG) and Mr. Ray Waldbaum concerning the Russian River County Sanitation District's proposed equalization basin project (RREQ Basin). SWiG provided comments on the Draft Environmental Impact Report (DEIR) for the proposed Russian River County Sanitation District's Equalization Basin, and their comments were provided in a letter dated September 20, 2007. Mr. Waldbaum's comments were provided in a letter dated November 19, 2007 titled "Geologic Peer Review, Russian River County Sanitation District Equalization Storage Basin Project." Mr. Waldbaum's letter was address to Jane E. Nielson of SWiG and provided to the Sonoma County Water Agency by Shute, Mihaly & Weinberger LLP in a letter dated November 27, 2007. We have divided our responses into two sections specific to the each of the two letters.

Section 1

Response to SWiG (September 20, 2007) comments on the Draft Environmental Impact Report (DEIR) for the proposed Russian River County Sanitation District's (RRCSD) "Equalization Basin."

Geologic Resources (Section 3.2)

Comments under this subheading of the SWiG letter focused on the misidentification of the Wilson Grove Formation as the Merced Formation and the absence of the Wilson Grove in the RREQ basin site. The geologic unit under discussion is in fact termed the Wilson Grove

Formation as stated in the comment and it is not known to be present at the project area. The misidentification of the geologic unit in the DEIR could well have resulted from the use of Sonoma County geology for planning maps which at the time of their publication in 1980 did not yet recognize the Wilson Grove as a separate, and significantly older unit from the Merced Formation. Because the Wilson Grove Formation is not present at the project site its misidentification should be of no consequence to the DEIR.

The characterization of the site's soils as "Yolo sandy loam" is criticized as too simplistic. This soil classification was used in the DEIR to characterize soil drainage, erosion potential and runoff characteristics. From an engineering geologic standpoint, the site's soils generally occur in two geologic units, colluvium and alluvium. The colluvial soils are a poorly sorted mixture of soil and rock fragments present on project area slopes. Included in this unit are soil deposits produced by slope erosion, debris flow, rock fall and landsliding. Colluvium is typically thickest where it accumulates near the base of slopes, within drainage swales and where steep hillside drainages outwash onto the gently sloping river terraces to form alluvial fans.

In contrast to colluvium are alluvial soils that include the relatively well-sorted water-laid deposits of the Russian River. Alluvial soils underlie the gently sloping river terrace in the southern portion of the RREQ basin site. Alluvium includes silt, sand, gravel and clay strata. The alluvium is interpreted to interfinger with colluvium in the middle portion of the basin footprint.

Seismicity and Shaking Intensities (p. 3.2-2 to 3.2-6)

The SWiG comment provided in the first paragraph of this section implied that a potential exists for fault displacement to occur along shear zones within the highly deformed Franciscan Complex. In general a possibility exists for fault displacement to occur along nearly any weakness in the earth's crust including ancient shear zones, old faults and even through unfaulted ground. However as a practical matter, the development of a new fault or reactivation of a long-inactive fault is relatively uncommon and generally not a concern in site development. Rather, in California mitigation measures for fault surface rupture hazard are applied to active faults, that is those faults that have experienced displacement during the Holocene (past 11,000 years). The absence of active faults at the site indicate that the potential for fault surface rupture is very low and would not warrant further consideration in the DEIR.

The comments in the second paragraph focus on liquefaction hazards and the potential for damage from strong earthquake shaking to "specially-designed structures." The liquefaction hazards were recognized and characterized in the site-specific geotechnical investigations (Giblin, 1997 and 2007). As part of those investigations a variety of mitigation measures were provided to mitigate the liquefaction hazard including the following:

- Deep dynamic compaction
- Injection grouting
- Stone columns
- Deep displacement piers

In general the mitigation measures listed above were intended to provide a list of soil improvement techniques that could be used to increase the density and strength of the site soils to reduce potential consolidation settlement of fill embankments and resist lateral spread and excessive liquefaction related settlement. The DEIR indicates that the proposed project will include the installation of an "Impact Intermediate Foundation System." This system is a deep ground modification method that includes a series of drilled holes filled with compacted aggregate, increasing density and strength of surrounding soils and decreasing potential settlement and liquefaction risk. Provided the deep foundation system is properly designed and constructed, we judge that the risk of liquefaction and settlement would be satisfactorily reduced to a low level. During installation of the compacted aggregate piers, additional field testing would be needed to confirm that sufficient density of the adjacent soils is being achieved.

Geotechnical measures were recommended as part of geotechnical investigation reports (Giblin 1997, 2007) to reduce the potential for serious damage to structures from strong earthquake ground motions (not related to liquefaction). Depending on the specific structure, the measures could include grading measures such as removing weak highly compressible soils and replacing them with properly compacted fill, constructing embankments at appropriate slope inclinations, proper placement and compaction of fill, and subdrainage to prevent excessive pore pressures beneath fills and buttresses. In addition seismic design criteria were provided and a probabilistic analysis was performed to estimated peak ground accelerations with a probability of exceedance of 10 percent in 50 and 100 years. The seismic criteria were provided to support the structural engineering design of project structures.

Landslides (p. 3.2-6 to 3.2-12)

SWiG's comments in this section of this letter focus on the potential for debris flows originating on south-facing slopes above the site to displace and release contaminated waste water from the basin. The site has experienced a number of small debris flows in the past that have affected the plant access roads and an effluent storage pond located east of the current project site.

A relatively steep, seasonal drainage ascends the south slopes of Neeley Hill north of the proposed pond location. Upslope from the plant's main access road, where this drainage is narrow and bound by steep slopes, the drainage is filled with colluvium containing numerous boulders and cobbles. At the pond site the colluvium is significantly less coarse and is composed predominantly of gravel, sand and silt. The composition of the colluvium, the configuration of the topography at the pond site, and the history of small debris flows in the project vicinity indicate that the north end of the proposed pond is located at the distal end (lower) of an alluvial fan. The fan was apparently formed by sediment from both debris flow and sediment-laden runoff outwashing from the drainage.

Measures to reduce the debris-flow hazard to the project could include a combination of measures including the following:

- Drainage improvements to an access road that ascends the south side of Neeley Hill and diverts road runoff into the drainage that affects the project area.

- Constructing debris catchment structures to intercept debris before it reaches the basin and/or plant access road. Catchment could be accomplished utilizing debris fences, retaining walls or soil and/or rock berms located in a manner that would intercept and retain sediment. Equipment access to the catchment structures should be provided in order to facilitate periodic debris removal and maintenance.

- Placement of debris-flow deflection structures in a manner that redirects runoff and sediment around the pond. This could be accomplished utilizing earthen berms or walls. A debris pathway or runout channel would have to be provided for debris diverted along the east side of the pond embankment. With some modification, the pond embankment as proposed could be modified to serve as a debris deflection and/or catchment structure.

Hydrology and Groundwater (p. 3.3-1 to 3.3-4)

The SWiG comments pertain to high groundwater levels and their potential to damage the basin liner. Groundwater levels are suspected to be at or slightly below the bottom of the proposed basin. However, unusually high groundwater levels resulting either from prolonged or intense precipitation or river flooding could create a potential for buoyancy forces to affect the permeable pond liner. Consequently, lowering groundwater under the basin liner during periods of high groundwater may be necessary and would probably require an underdrain and sump or an active pump-type dewatering system. When necessary, discharged groundwater could be lifted and outlet either to the river terrace south of the pond or near the toe of the south embankment. It should be emphasized that liner buoyancy would be expected to occur only when high groundwater levels coincided with emptying of the basin. Because the basin is to provide temporary storage during periods of high storm runoff, it is presumed that the basin would normally be filled to a level above groundwater levels during these periods, and consequently dewatering would seldom have to be performed.

Section 2

Response to comments by Ray Waldbaum, in a November 19, 2007 letter titled "Geologic Peer Review, Russian River County Sanitation District Equalization Storage Basin Project."

Based on our review of Mr. Waldbaum's comments we identified three principal areas of concern. His concerns are summarized are as follows:

1. Unrecognized potential instability affecting the slope that ascends north from the RREQ basin site. The concerns expressed are specifically related to the possible presence of a deep-seated landslide and debris-flow hazards.

2. The absence of an evaluation of the subject slope by a "hazard expert."

3. The absence of a stability analysis to demonstrate that an adequate factor of safety exists for the subject slope.

Attached to Giblin's January 27, 1997 report titled *Geotechnical Investigation, Russian River County Sanitation District Disposal Expansion Project*, was a report by Jim Glomb (Certified Engineering Geologist #1154) addressing the slope stability conditions affecting the slopes north and east of the equalization basin. Mr. Glomb's report was titled *Landslide and*

Erosion Potential Evaluation and was dated December 19, 1996. The report included a map depicting the location of both a possible deep-seated slide based on published maps, and a debris flow path that directs runoff and debris flows toward the north side of the RREQ basin site.

Based on his work, which included field mapping, review of pertinent geologic maps, reports and aerial photographs, Mr. Glomb concluded that the deep-seated landslide, as mapped by the State, did not exist, and consequently no landslide hazard related to the deep-seated landslide affected the planned RREQ site. Further, the north side of the pond appears to be south of and outside the area mapped as a possible deep-seated landsliding. Based on our own reconnaissance of the site and nearby slopes, we would concur with Mr. Glomb's conclusions, particularly regarding the absence of a deep-seated landslide encroaching into the project site. The Glomb report did recognize the site's history of numerous small-scale debris flows and Plate 1 of his report depicted a ravine located upslope and north of the proposed basin that is capable of generating large volumes of runoff including debris flows toward the RREQ basin site. It was Mr. Glomb's conclusion that the drainage system for the canyon outlet at the north side of the RREQ basin should be hydrologically evaluated and upgraded, if necessary. The evaluation of potential slope instability by Mr. Glomb, including both a possible deep-seated landslide and a debris flow hazard, appears to address Mr. Waldbaum's concerns presented in comments 1 and 2 above. The absence of a deep-seated landslide indicates a slope stability analysis would be unwarranted, thereby addressing comment 3.

As part of Giblin Associates' 1997 and 2006 investigations of the RREQ basin, a number of borings were drilled in the proposed basin footprint. Two borings (No. 4 in 1997 and No. 1 in 2006) were drilled in the northwest pond area where the pond embankment is proposed. The borings in the northwest corner encountered clayey soils overlying deeply weathered bedrock of the Franciscan Complex at depths between 11½ and 13 feet. To address the potential for cut slope instability in that area it was recommended that a slope buttress be constructed.

The preliminary basin plans indicate that the embankment on the north side of the basin is to extend approximately 5 feet above the ground surface, except for a short section of the embankment located in the northwest corner where the embankment is to be constructed entirely as a cut slope. Based on the reported size of historic debris flows, the planned 5-foot-planned embankment is considered to be generally protective of the pond. Additional protection from debris flows could include heightening the berm, constructing debris deflections walls or catchment structures, reconfiguring the berms to direct debris around the basin rather than capturing it, and providing a well defined debris/runoff route that redirects debris away from other site facilities. Additionally "trash racks" could be installed at drainage inlets to reduce the potential for debris to clog the culvert inlets during periods of high sediment loads.

In summary, the deep-seated landslide depicted as possibly existing on the south slopes of Neeley Hill was evaluated by a Certified Engineering Geologist who concluded that the landslide did not exist and, as depicted, would not project into the proposed basin area. Further it was recommended that the embankment cut slope in the northwest pond corner should be buttressed. With regard to debris flow hazards incorporation of additional debris flow corrective measures into the final design could be performed to further reduce the potential debris flow hazard to a low level.

We trust this provides the information you require at this time. If you have questions or we can be of further assistance please give us a call.

Yours very truly,
GIBLIN ASSOCIATES

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REFERENCES

Giblin Associates, January 27, 1997, Geotechnical Investigation, Russian River County Sanitation District Disposal Expansion Project, Guerneville, California. Prepared for the Sonoma County Water Agency. Job No. 205.4.1. Includes as an Appendix Landslide and Erosion Potential Evaluation by Jim Glomb, December 19, 1996, Project No. 290.

Giblin Associates, April 29, 1997, Soil Investigation, Proposed Equalization Pond and Aeration Facility - Study Area B, Russian River County Sanitation District Disposal Expansion Project, Guerneville, California. Prepared for the Sonoma County Water Agency. Job No. 205.4.1.

Giblin Associates, January 15, 2007, Supplemental Report, Soil Engineering Consultation, Russian River Equalization Basin, Sonoma County, California. Prepared for the Sonoma County Water Agency. Job No. 205.7.3-2.

ATTACHMENT B

GEOTECHNICAL REPORTS (GIBLIN ASSOCIATES, APRIL 1997; GIBLIN ASSOCIATES, SEPTEMBER 2002; AND GIBLIN ASSOCIATES, JANUARY 2007)

Soil Investigation Report, Proposed Equalization Pond and Aeration Facility

Giblin Associates, April 1997

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Report
Soil Investigation
Proposed Equalization Pond and Aeration Facility - Study Area B
Russian River County Sanitation District
Disposal Expansion Project
Guerneville, California

Prepared for
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SONOMA COUNTY
APR 29 1997
WATER AGENCY

Job No. 205.4.1
April 29, 1997

INTRODUCTION

This report presents the results of our soil investigation for a proposed equalization pond and aeration facility at the Russian River County Sanitation Facility located at 18400 Neely Road in Guerneville, California. The proposed pond and aeration facility site are located within the existing treatment facility as indicated on the attached Plate 1. The aeration facility will consist of a one-story building of masonry block construction with a concrete slab-on-grade floor. The equalization pond could have a storage capacity of up to about 31 acre-feet, and will require embankment fills up to about 20 feet high on the downhill side with cuts on the uphill side. We understand that the interior slopes and bottom of the pond surface will have a concrete, gunite or similar hard-shell surfacing.

The object of our investigation, as outlined in the executed geotechnical services agreement, was to review selected geologic references in our files, explore subsurface conditions, measure depth to groundwater, if encountered, and determine physical properties of the soils encountered. We then performed engineering analyses to develop conclusions and recommendations concerning:

1. Proximity of the site to active faults

2. Site preparation and grading for the pond embankments, including an estimate of anticipated settlement and an evaluation of the on-site excavated soils for use as compacted fill pond lining

3. Foundation support and design criteria for the aeration facility

4. Supported of concrete slab-on-grade floors for the aeration facility

5. Retaining wall design criteria

6. Soil engineering drainage

7. Supplemental soil engineering services

A draft report dated January 31, 1997, was submitted for review. Review comments were summarized in your letter to us dated March 10, 1997, and as requested, our responses have been incorporated into this final report.

WORK PERFORMED

We reviewed selected, published, geologic and geotechnical information in our files including:

1. The "Geologic Map of the Santa Rosa Quadrangle, California," by D. L. Wagner and E. J. Bortugno, California Division of Mines and Geology, 1982.

2. The "Geology for Planning in Sonoma County" maps, Special Report 120, California Division of Mines and Geology, 1980.

3. Report, "Guerneville Pond, Russian River, Guerneville, California," by Jim Glomb, Consulting Engineering Geologist, dated December 19, 1996.

4. Flood Insurance Rate Map (FIRM) Panel No. 060375 655-B, September 1983 (revised April 2, 1991), Federal Emergency Management Agency (FEMA).

On January 7 and 8, 1997, we were at the site to observe surface features and explore subsurface conditions to the extent of six test borings at the approximate locations indicated on Plate 1. The borings were drilled to depths of about 13½ to 50 feet with truck-mounted, power auger and rotary-wash drilling equipment. Our engineer located the borings, observed the drilling, logged the conditions encountered, and obtained samples for visual classification and laboratory testing. Relatively undisturbed samples were obtained with a 2.5-inch (inside-diameter) split-spoon sampler driven with a 140-pound drop hammer. The stroke during driving was about 30 inches. The blows required to drive the sampler were recorded and converted to equivalent Standard Penetration blow counts for correlation with empirical data. Logs of the borings showing soil classifications, sample depths and converted blow counts are presented on Plates 2 through 7. The soils are classified in accordance with the Unified Soil Classification System explained on Plate 8.

Selected samples were tested in our laboratory to determine moisture content, dry density, classification (percent free swell, percent passing No. 200 sieve and Atterberg Limits),

strength, permeability and consolidation characteristics. The test results are shown on the logs with strength data shown in the manner described by the Key to Test Data, Plate 8. Detailed results of the Atterberg Limits and consolidation tests are shown on Plates 9 through 12. Permeability tests were performed on combined samples from Borings 2 and 4 (positioned in proposed cut areas), and the results are summarized on Plate 13.

The boring locations shown on Plate 1 were determined by visually estimating from existing surface features. The locations should be considered no more accurate than implied by the methods used to establish the data. At the completion of the exploration, all the borings were backfilled with a cement/bentonite slurry.

SURFACE AND SUBSURFACE CONDITIONS

The aeration facility building site is located on a southeast facing slope adjacent to the west side of the operations building. The ground slopes up to the northwest from an existing driveway at a gradient visually estimated at four to five horizontal to one vertical (4:1 to 5:1). The area is presently covered with lawn, and a large evergreen tree is located just upslope of the proposed building location.

The proposed pond site is located downslope and to the west of the operations building. The maximum difference in elevation

across the pond site is about 35 feet, with the northern portion sloping downward to the south at about 4:1 and the southern portion being nearly flat. A fence roughly bisects the pond site in the north/south direction and the eastern portion is currently being used to provide access to the existing facility and parking for heavy equipment. The western portion is covered with natural grasses and a few small trees. A marsh area located at the base of the more steeply sloped portion contains standing water and tall reeds. Shallow seepage of water was noted on the ground surface upslope of the marsh area.

Our borings and laboratory tests indicate that the site is underlain by discontinuous layers of sandy clays and silts, clayey gravels and sands and highly weathered bedrock materials to the maximum depth explored. The upper soils in Borings 2, 4, 5, and 6 consist of gravelly fills that were likely placed for access roadway construction. The depth of the fills generally varies up to about 3 to 5 feet. Boring 3 was positioned in the approximate center of the proposed pond and encountered soil mixed with abundant tree bark and wood fragments to a depth of about 15 feet. We believe that Boring 3 likely was positioned within an old debris pit possibly excavated and backfilled during past logging operations on the property. The natural soils below the fills and on the surface in Boring 1 consist of clayey and gravelly colluvial or residual materials of low to moderate

strength and compressibility. The underlying soils consist of alternating layers of clays, silts, sands and gravels of apparent moderate strength and compressibility overlying highly weathered bedrock material of the Franciscan formation.

Groundwater was observed in four of our borings during exploration at a depth of about 5 to 13½ feet below the surface. Also, ponding water was observed in the lower portion of the site from recent heavy rains, and shallow seepage of water was locally noted. We believe that groundwater and seepage levels vary seasonally and could rise and fall several feet annually.

DISCUSSION AND CONCLUSIONS

Based on the results of our field exploration, laboratory test and engineering analysis, we conclude that, from a soil engineering standpoint, the site can be used for the proposed construction of the aeration facility and equalization pond. However, there are significant soil engineering factors concerning the proposed equalization pond that must be considered in design and construction. The factors include: 1) the presence of existing fills and weak, compressible, upper natural sandy, gravelly, clayey and/or silty soils; 2) high groundwater table; and 3) an area of possible slope instability uphill of the north end of the proposed pond location.

Equalization Pond

The natural soils encountered below the fills in the southern portion of the site exhibit relatively low to moderate strength to a depth of about 30 feet below the ground surface. Laboratory consolidation tests indicate that the soils appear to be normally consolidated. That is, the materials have come to near equilibrium under their own weight. However, the consolidation tests also indicate that the soils would be subject to significant settlement under new loads. The amount and rate of settlement are influenced by several factors, including past loading history, thickness of planned new fills, and variations in the thickness and compressibility of the compressible soils. We have performed settlement analyses to estimate the magnitude of total settlements resulting from the proposed embankment loads. Our analyses indicate that total settlements resulting from a 20-foot-high fill embankment with 3:1 side slopes would be about 11 to 12 inches. The largest settlement would occur beneath the crest of the embankment where the fills are thickest, varying to little or no settlement at the toe of the embankment slopes, resulting in a dishing of the bottom of the embankment. For embankment fills with steeper slopes, the calculated settlements are slightly less. However, more steeply sloped embankments may require special grading techniques to provide stability, as subsequently discussed. We judge that settlements

of such magnitude could result in distress to the pond and/or lining materials. We have considered several alternatives to help mitigate potential distress resulting from the anticipated settlements including: 1) overexcavation of a portion of the compressible soils and replacement as compacted fill; 2) surcharging of fill areas to promote settlement prior to installation of the pond lining; and 3) the use of ground modification methods such as deep dynamic compaction, injection grouting or stone columns.

Our analysis indicates that approximately two-thirds of the calculated total settlement would occur in the soils encountered within about 12 feet of the existing ground surface. We have calculated that total settlements could be reduced to about 8 inches by removing the upper 6 feet of the compressible soils and replacing the materials as properly compacted fill. Deeper overexcavations would further reduce total settlements, however, high groundwater levels could limit the depth of excavation. As previously discussed, groundwater was observed in our borings in the lower portion of the site at a depth of about 5 feet, and ponding water was noted in adjacent areas. Our field exploration was performed relatively soon after heavy winter rains that caused flooding of the nearby Russian River, and therefore, we would expect lower groundwater levels during late summer or fall months.

Another method to reduce the risk of distress from the anticipated settlements would be to construct the embankment fills and allow the underlying soils to consolidate prior to completion of the pond construction. The underlying soils consist of alternating layers of sandy clays or silts and clayey sands and gravels. The granular materials (sands and gravels) tend to consolidate much more rapidly than clays or silts. In general, our analyses suggest that much of the anticipated settlement would likely occur within the first year after placement of the fill loads. However, because the underlying deposits are relatively nonuniform, the actual time to consolidate is difficult to evaluate. With this alternative, we would recommend that settlement of the embankments be closely monitored after completion of the fill placement. Installation of vertical wick drains beneath the fills have shown to be effective at reducing the time required for consolidation of underlying compressible soils. We could provide specific recommendations for the use of wick drains, if requested.

There are other ground modification techniques available to reduce settlement that could allow construction of the pond to proceed without significant delays in construction. Such techniques include high pressure injection grouting of the underlying soils to add strength and reduce compressibility, installation of "*stone columns*" beneath the embankments (drilled

boring encountered slightly plastic clayey materials to a depth of about 11 feet. The upper soils were underlain by firm sandstone bedrock. We judge that possible landsliding upslope of the northwest area of the pond site is likely more shallow than deep-seated. To insure near-surface stability, a cut-slope buttress at the northwest corner of the pond may be needed, as subsequently discussed.

It should be understood that the factors that influence slope stability are complex, and there is an inherent risk on any hillside or river bank site. We judge that properly designed and constructed improvements would be stable and, provided the recommendations presented herein are implemented, the risk of future instability would be within the range generally associated with such developments in the Sonoma County area.

In response to comments summarized in your letter dated March 10, 1997, we have calculated the approximate storage capacity of a pond with 1¼:1 interior slopes and 2:1 exterior slopes, with the bottom of the pond being assumed at elevation 45 (approximate groundwater elevation). The top of the levees was assumed to be a elevation 76, with a maximum storage water height at elevation 73. In addition, we assumed that the toe of the planned embankment fills would be approximately 5 feet from the property line, and that the pond would be rectangular in shape. Because of the anticipated width of the embankments, we neglected

the easternmost portion of the pond from our calculations, as shown on attachment B of the geotechnical services agreement. Based on the assumed geometry of the pond, we calculated a storage capacity of about 19- to 21-acre-feet, with a maximum water depth of about 28 feet and a maximum distance from the toe of the highest embankment to the top of the water level surface of about 25 feet.

Because of the geometry of the site and the possible presence of organic- or debris-laden soils unsuitable for reuse, a sufficient volume of on-site soils may not be available for construction of a standard embankment with 2:1 exterior and 3:1 interior slopes. We have consulted with a local grading contractor experienced in both conventional grading techniques and construction of geosynthetic reinforced fills. Because access to the site is relatively difficult and somewhat remote, importation of additional fill soils would likely be more expensive than constructing steeper embankment slopes utilizing geosynthetic reinforcing. After an actual configuration of the pond has been determined, we suggest that cut/fill quantities be calculated by a design civil engineer for use in better evaluating grading cost. A reduction factor should be applied in the calculations to account for shrinkage of the soil resulting from compaction.

Because of the physical site constraints (high groundwater table, liquefiable soils, potential for slope instability, etc.), we judge that the pond configuration discussed above would be the appropriate size for the site without incurring significant additional cost to mitigate the potential geotechnical hazards.

Aeration Facility

Satisfactory foundation support for the aeration facility building can be obtained from spread footings bottomed at relatively shallow depths on properly compacted fill or on firm, natural soils. For building footings designed and installed in accordance with our recommendations, we judge that total settlement will be about 1/2-inch or less. A portion of the settlement will occur during construction. However, because the underlying materials are clayey, some of the settlements will occur over a several year period.

Provided the building site is prepared in conformance with our recommendations, concrete slab-on-grade floors can be used. The floor slab must similarly be supporting on firm natural soil or properly compacted fill of low expansion potential. Our laboratory tests indicate that the near-surface materials in the aeration facility site exhibit a low expansion potential. Therefore, we judge that the floor slab and foundations can bear directly on properly prepared on-site soils.

Geology - Our review of the geologic maps indicate that there are no active faults at the site and, therefore, we judge there is little risk of fault-related ground rupture during earthquakes. However, the site is located in a seismically active region, as is all of Sonoma County. The closest faults generally considered active are the San Andreas fault zone located approximately 8½ miles to the southwest and the Healdsburg fault zone approximately 12 miles to the northeast. The area will be subject to severe ground shaking during earthquakes. Therefore, it will be necessary to design and construct the project in strict accordance with current standards for earthquake-resistant construction. The Flood Prone Areas map reviewed indicates that the 100-year flood level is located just downslope of the proposed pond site.

RECOMMENDATIONS

Equalization Pond

Site Grading - The areas to be graded should be cleared of vegetation, grass and surface organic debris, where encountered. The cleared areas then should be stripped of the upper soils containing root growth and organic matter. We anticipate that the required depth of stripping would average about 3 inches, where needed. The strippings should be removed from the site or stockpiled for reuse as topsoil.

After stripping, excavation should be performed as necessary. We anticipate that with the exception of organic matter and rocks or hard fragments larger than 6 inches in diameter, the excavated materials will be suitable for reuse as embankment fill and, if properly mixed with imported clayey soils or bentonite, may be suitable for pond lining material, if needed. Additional laboratory testing should be performed to determine the appropriate mixture of the on-site soils with imported clay or bentonite and the required thickness of the soil lining to achieve the desired lining properties.

To provide adequate embankment support, existing fill and weak, upper soils should be excavated and stockpiled for reuse as fill. The excavation should include the planned embankment area and extending to at least 5 feet outside the planned toe of the embankment. The minimum depth of the excavation to remove existing fill and weak, upper soils is anticipated to be about 2 to 3 feet below the grade exposed by stripping. Deeper, localized overexcavation may be needed to remove deeper fill (such as in the debris pit area penetrated with Boring 3) or weak soils, if encountered. If it is desired to reduce the magnitude of total settlements utilizing grading techniques, the excavation in embankment areas should be deepened. As discussed above, excavation depths could depend greatly on the groundwater elevation at the time the grading work is performed.

The surfaces exposed by excavation or overexcavation then should be scarified, moisture conditioned to slightly wet of optimum and compacted to at least 92 percent relative compaction.[1] Planned fill materials then should be placed in 8-inch-thick loose layers, moisture conditioned to slightly above optimum, and compacted to at least 90 percent relative compaction with sheepsfoot-rollers or other approved kneading-type compactors.

To provide space for a compacted fill lining within the pond area, if used, including the interior embankment slopes, existing soils that are exposed in the bottom and sides after pond excavation should be cut below planned grade. The materials then should be blended with approved material and replaced as properly compacted fill. The pond liner zone is discussed below in the Pond Design Criteria and Lining section.

Loose granular materials exposed in the cut slopes of the pond bottom may need to be overexcavated and replaced as properly keyed and benched compacted fill to mitigate potential liquefaction and/or settlement risks. The need for additional excavation of loose soils and replacement as compacted fill should be determined during final design when the depth and

[1] Relative compaction refers to the in-place dry density of fill expressed as a percentage of maximum dry density of the same material determined in accordance with the ASTM D 1557-91 laboratory compaction test procedure.

configuration of the pond are established or in the field by the soil engineer.

Embankment fill material should be free of organic matter and rocks or hard fragments larger than 6 inches in diameter, and should conform in general to the following requirements:

Sieve Size	Percent Passing
6-inch	100
4-inch	90 - 100
No. 200	30 - 100
Liquid Limit	- 50 Percent Maximum
Plasticity Index	- 20 Maximum

Embankment fills should similarly be placed in thin lifts, moisture conditioned to slightly wet of optimum and compacted to at least 90 percent relative compaction.

Planned cuts in the northwest portion of the pond site should be carefully observed by the geotechnical engineer and engineering geologist. The conditions exposed may warrant the need for a compacted fill buttress with subdrainage, as determined in the field. For reference, a typical cross-section of a compacted fill buttress is shown on Plate 14.

Design Criteria and Compacted Soil Lining - In general, unless reinforced with geosynthetic materials, the interior embankment and pond slope should be inclined no steeper than 3:1. Exterior fill and/or embankment slopes should be no steeper than

2:1. The minimum crest width of the pond embankment should be at least 10 feet.

If a compacted soil lining is to be used, the excavated pond lining area should be refilled with properly compacted, approved on-site soils blended with approved clayey soils or bentonite placed at least 2 percent wet of the optimum moisture content and compacted to 90 percent or more relative compaction. The actual degree of compaction required is dependent upon the quality and percentage of imported clayey admixture and should be determined by additional laboratory testing of the proposed mix materials. If imported soils are desired in lieu of bentonite clay, the materials (or blend of imported materials mixed with on-site soils) should be free of organic matter and conform, in general, to the following requirements:

Sieve Size	Percent Passing
3-inch	100
No. 4	75 - 100
No. 200	30 - 100
Plasticity Index	- 20 or greater

The finish lining material after compaction should achieve a coefficient of permeability of 1×10^{-6} cm/sec or slower, as required by the design engineer or regulatory agency.

Slope Protection - Periodic observation of the embankment slope faces should be performed. To help reduce possible erosion

of the exterior embankment slope, the slope face should be planted with fast-growing ground cover.

Aeration Facility

Site Grading - Within the building floor slab area and extending to at least 5 feet beyond the perimeter or 3 feet beyond adjacent exterior concrete slab areas (building envelope), existing weak surface soils and fill materials (if encountered) should be overexcavated. We anticipate the depth of overexcavation will vary from about 2 to 2½ feet below the grade exposed by stripping. Deeper overexcavation may be needed if deeper weak natural soils or fills are encountered. During the grading, the building envelope should be probed for the presence of highly expansive soils. Any moderate to highly expansive soils encountered should be overexcavated to at least 24 inches below planned building pad elevation.

The surfaces exposed by stripping or overexcavation should be scarified to a depth of at least 6 inches, moisture conditioned to at least 3 percent above optimum and to close any shrinkage cracks for their full depth, and compacted to at least 87 percent relative compaction. Approved on-site or imported nonexpansive fill materials then should be spread in 8-inch-thick loose lifts, moisture conditioned, and similarly compacted.

Imported fill, if needed, should be low in expansion potential and have a Plasticity Index of 15 or less. Imported fill material should be free of organic matter and rocks or hard fragments larger than 4 inches in diameter.

Finished slopes should be trimmed to expose firm material and should be no steeper than two horizontal to one vertical (2:1). Slopes over 3 feet high should be planted with fast-growing, deep-rooted ground cover to reduce erosion.

Foundations - Spread footings can be used for foundation support of the aeration facility and should be at least 12 inches wide. Footings should bottom at least 12 inches below lowest adjacent pad elevation. Where underlain by at least 12 inches of properly compacted fill, spread footings can be designed to impose dead plus code live load and total design load (including wind or seismic forces) bearing pressures of 2,000 and 3,000 pounds per square foot (psf), respectively. Where footings are underlain by less than 12 inches of properly compacted fill or are bottomed on firm natural soil, these values should be reduced by 25 percent.

Resistance to lateral loads can be obtained from passive earth pressures and soil friction. We recommend the following criteria for design:

Passive Earth Pressure	=	300 pounds per cubic foot (pcf) equivalent fluid, neglect the upper 1-foot, unless confined by pavement or slab
Soil Friction Factor	=	0.30

Slab-on-Grade - Provided the site is prepared as recommended above, floor slab areas should be underlain by firm underlying soil or bedrock material or properly compacted, approved on-site or imported fill materials of low expansion potential. Slab-on-grade subgrade should not be allowed to dry prior to concrete placement. In addition, slabs should be underlain by a capillary moisture break and cushion layer consisting of at least 4 inches of free-draining, crushed rock or gravel (drainrock). The drainrock should be at least 1/4-inch and no larger than 3/4-inch in size. Moisture vapor will condense on the underside of slabs. Where moisture migration through slabs is detrimental, a moisture vapor barrier should be provided between the drainrock and the slabs. At least 2 inches of clean, moist sand should be placed over a plastic membrane, if used, to aid in slab curing and help provide puncture protection.

The slabs should be at least 4 inches thick and be reinforced as necessary based on anticipated use and performance. The actual slab thickness and amount of reinforcing used should be determined by the design engineer. However, because of

anticipated differential supporting conditions consisting of cuts on the uphill side and fills on the downhill side, we suggest that bar reinforcing be considered.

Retaining Walls - Retaining walls that are free to rotate slightly and support level (and up to 3:1) backfill should be designed to resist an active equivalent fluid pressure of 40 pcf acting in a triangular pressure distribution. Where the backfill slope is steeper than 3:1, the pressure should be increased to 60 pcf. If the wall is constrained at the top and cannot tilt, the design pressures for level and sloping backfill should be increased to 60 and 80 pcf, respectively. Where retaining wall backfill is subject to vehicular traffic, the walls should be designed to resist an added surcharge pressure equivalent to 1½ feet of additional backfill.

Spread footings can be used for retaining walls. Spread footings must bottom below any weak or root-laden soils. Therefore, local deepening of footings should be anticipated.

The portion of retaining wall foundations extending into firm, natural soil or bedrock at least 8 horizontal feet from the face of the nearest slope can impose a passive equivalent fluid pressure and a friction factor of 300 pcf and 0.30, respectively, to resist sliding. Spread footings can be designed for dead plus long term live load and total design load (including wind or

seismic forces) bearing pressures of 1,500 and 2,250 psf, respectively.

Retaining walls should be fully backdrained. The backdrains should consist of 4-inch-diameter, perforated pipe sloped to drain to outlets by gravity and clean, washed, free-draining crushed rock or gravel (drainrock). The crushed rock or gravel should extend to within 1 foot of the surface. The drainrock should be covered and separated from the soil bank by a nonwoven, geotextile fabric[2] weighing at least 4 ounces per square yard. The upper 1 foot should be backfilled with compacted soil to inhibit surface water infiltration unless capped with a concrete slab or asphalt paving. The ground surface behind retaining walls should be sloped to drain. Where migration of moisture through walls would be detrimental, the walls should be waterproofed.

Geotechnical Drainage - Ponding water will cause softening of site soils and would be detrimental to foundations. It is important that the areas adjacent to footings be sloped to provide positive drainage away from foundations. The roof should be provided with gutters, and the downspouts should discharge onto paved areas or splash blocks draining at least 30 inches

[2] Mirafi 140N and Supac 5 are among the brand names of suitable fabrics that may be locally available.

away from foundations. Water should be intercepted at the top of slopes and diverted into drainage facilities.

Where irrigated landscape areas abut the building, excess water can be introduced into soil layers along the edge of the building, tending to soften soils in the footing areas, and induce extra moisture into the drainrock under the floor slab. Planter areas adjacent to the building should be lined with visqueen (or equivalent) and provided with a drain that outlets into planned drainage facilities.

Supplemental Services - We should provide additional consultation as design of the equalization pond progresses to further evaluate stability of slopes, settlement and liquefaction risks based on the actual pond configuration. We should review final grading and foundation plans for conformance with the intent of our recommendations. During site grading operations, we should be notified to provide intermittent observation and testing to determine the conditions encountered. We should observe building and retaining wall footing excavations to verify that suitable bearing materials are exposed, that the conditions encountered are as anticipated, and to modify our recommendations, if warranted. Foundation excavation depth and cleanliness, forms and reinforcing should be checked by the Building Department.

MAINTENANCE

Periodic land maintenance will be required. Drains should be checked regularly and cleaned and maintained as necessary. A dense growth of deep-rooted, fast-growing ground cover should be established and maintained on all graded slopes. Sloughing, erosion or sliding are common on newly graded slopes, especially during the first few winters. Therefore, supplemental erosion inhibitors may be prudent to apply, such as jute mesh or other commercially available materials. Any such sloughing, erosion or sliding that does occur should be repaired promptly before it can enlarge.

LIMITATIONS

We have performed the investigation and prepared this report in accordance with generally accepted standards of the soil engineering profession. No warranty, either express or implied, is given.

Subsurface conditions are complex and may differ from those indicated by surface features or encountered at test boring locations. Therefore, variations in subsurface conditions not indicated on the logs could be encountered.

If the project is revised or if conditions different from those described in this report are encountered during construction, we should be notified immediately so that we can take timely action to modify our recommendations, if warranted.

Supplemental services as recommended herein are performed on an as-requested basis. We can accept no responsibility for items we are not notified to check, nor for use or interpretation by others of the information contained herein. Such services are in addition to this soil investigation, and are charged for on an hourly basis in accordance with our Standard Schedule of Charges.

Site conditions and standards of practice change. Therefore, we should be notified to update this report if construction is not performed within 24 months.

GIBLIN
ASSOCIATES
CONSULTING
GEOTECHNICAL
ENGINEERS

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DISTRIBUTION

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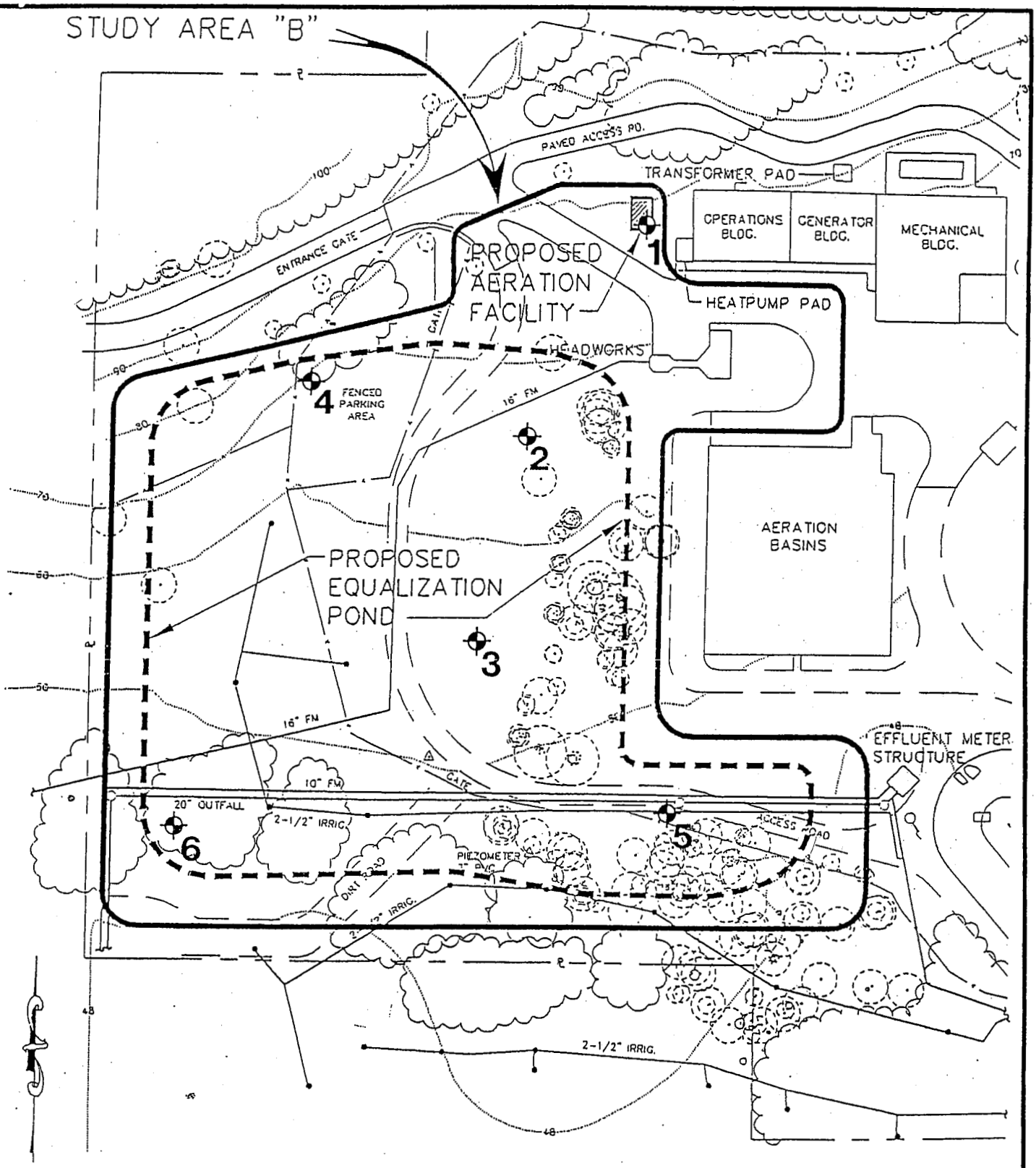
Sonoma County Water Agency
2150 West College Avenue
Santa Rosa, CA 95401
Attention: Mr. Kevin Berger

JKR/JAG:nay.B-70



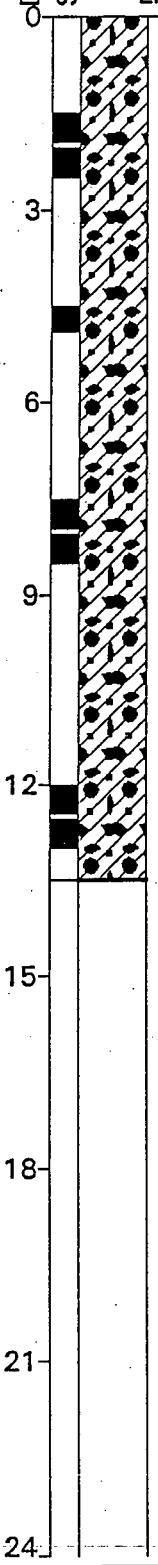
⊕ APPROXIMATE TEST BORING LOCATION

GIBLIN ASSOCIATES CONSULTING GEOTECHNICAL ENGINEERS	Job No: 205.4.1 Date: 01-14-97 Appr: JHR	TEST BORING LOCATION PLAN EQUALIZATION POND AND AERATION FACILITY GUERNEVILLE, CALIFORNIA	PLATE 1

LOG OF BORING 1

Equipment 6" FLIGHT AUGER

Elevation _____ Date 1-7-97



Laboratory Test Results or Remarks	Blows/foot *	Moisture Content (%)	Dry Density(pcf)	Depth (ft)	
				0	MOTTLED RED-BROWN SANDY CLAYEY GRAVEL (GC) medium dense, wet
Percent Free Swell = 30	14	13.3	120		
				3	
	9				becomes less clayey
				6	
					becomes orange-brown in color
TxUU = 2700(1000)	13	11.1	124		
				9	
UC(P) = 4000		11.9	121	12	becomes more clayey, wet
					(No free water encountered)
				15	
				18	
				21	
				24	

*Converted to Standard Penetration Blow Counts

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LOG OF BORING 1

EQUALIZATION POND AND AERATION FACILITY
GUERNEVILLE, CALIFORNIA

PLATE 2

▽ ground-water first encountered at time of drilling

LOG OF BORING 2

Equipment 6" FLIGHT AUGER

Elevation _____ Date 1-7-97

Laboratory Test Results or Remarks	Blows/foot *	Moisture Content (%)	Dry Density(pcf)	Depth (ft)	Sample	
				0		BROWN CLAYEY GRAVEL (GC) medium dense, moist
	6-1/2					
Percent Free Swell = 40	5			3		
				6		ORANGE-BROWN SANDY CLAYEY GRAVEL (GC) loose, wet
	6					
				9		
				12		becomes light yellow-brown in color
Percent Passing No. 200 Sieve = 18.8 UC(P) = 1200	8-1/2	9.9	122			
				15		becomes medium dense, saturated
	18	14.8	123	18		
				21		
	10					
				24		

▽ water level

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LOG OF BORING 2

EQUALIZATION POND AND AERATION FACILITY
GUERNEVILLE, CALIFORNIA

PLATE 3

*Converted to Standard Penetration Blow Counts

ground-water first encountered at time of drilling

LOG OF BORING 3

Equipment _____

Elevation _____ Date 1-7-97

Laboratory Test Results or Remarks	Blows/foot *	Moisture Content (%)	Dry Density(pcf)	Depth (ft)	Sample	
				0		YELLOW AND BROWN CLAYEY GRAVEL (GC) medium dense, moist
	14-1/2					
						BROWN SANDY CLAY (CL) soft, wet to saturated, with abundant organics (wood fragments, bark, etc.)
				3		
				6		
	5-1/2					
				9		
	5					
				12		
				15		ORANGE-BROWN CLAYEY GRAVEL (GC) medium dense, saturated
	13-1/2					
				18		
	14	12.1	130			
				21		
				24		

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LOG OF BORING 3

EQUALIZATION POND AND AERATION FACILITY
GUERNEVILLE, CALIFORNIA

PLATE 4

*Converted to Standard Penetration Blow Counts

LOG OF BORING 4

▽ ground-water first encountered at time of drilling

Equipment 6" FLIGHT AUGER

Elevation _____ Date 1-7-97

Laboratory Test Results or Remarks	Blows/foot *	Moisture Content (%)	Dry Density(pcf)	Depth (ft)	Sample	
				0		DARK GRAY CLAYEY GRAVEL (GC) loose to medium dense, moist to wet
	7.5					BROWN SANDY CLAY (CL) soft to medium stiff, moist to wet
Percent Free Swell = 15 UC(P) = 2500	5	19.9	104	3		
	8-1/2			6		RED-BROWN SANDY CLAY (CL) very stiff, wet, with occasional gravel
Percent Free Swell = 25 UC(P) = 4500+	18-1/2	15.7	110			
Liquid Limit = 37 Plastic Limit = 21 Plasticity Index = 16 Percent Free Swell = 40	32-1/2			9		becomes hard
UC(P) = 4500+	35	13.9	122	12		BROWN AND DARK GRAY SHALE AND SANDSTONE BEDROCK MATERIAL OF THE FRANCISCAN FORMATION, highly weathered, friable
	50+	11.0	126	15		
				18		
	50+	5.8	131	21		(No free water encountered)
				24		

*Converted to Standard Penetration Blow Counts

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LOG OF BORING 4

EQUALIZATION POND AND AERATION FACILITY
GUERNEVILLE, CALIFORNIA

PLATE 5

LOG OF BORING 5

Equipment ROTARY WASH

Elevation _____ Date 1-8-97

Laboratory Test Results or Remarks	Blows/foot *	Moisture Content (%)	Dry Density(pcf)	Depth (ft)	Sample	
				0		LIGHT AND DARK BROWN SANDY CLAY (CL) medium stiff, wet, with occasional gravel
Percent Free Swell = 35	8	14.2	114			
UC(P) = 3300	10-1/2	24.9	99	3		
	5					GRAY AND LIGHT BROWN SANDY CLAY (CL) soft to medium stiff, moist
				6		
UC(P) = 800 Percent Free Swell = 40	9-1/2					DARK GRAY VERY SANDY SILT (ML) medium stiff, wet
						BROWN CLAYEY SAND (SC) medium dense, saturated
				9		
TxUU = 380(1500) Percent Passing No. 200 Sieve = 47.8	5-1/2	16.1	117			
						becomes loose
				12		
UC(P) = 500 Percent Passing No. 200 Sieve = 36.7	6-1/2	17.9	115			
				15		
Percent Passing No. 200 Sieve = 35.5	12	14.5	121			BROWN CLAYEY SAND (SC) medium dense, saturated
				18		
						medium dense
				21		
				24		

*Converted to Standard Penetration Blow Counts

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LOG OF BORING 5

EQUALIZATION POND AND AERATION FACILITY
GUERNEVILLE, CALIFORNIA

PLATE 6a

LOG OF BORING 5

Equipment ROTARY WASH

Elevation _____ Date 1-8-97

Laboratory Test Results or Remarks	Blows/foot *	Moisture Content (%)	Dry Density(pcf)	Depth (ft)	Sample
				24	
Percent Passing No. 200 Sieve = 52.8	13-1/2	15.4	121		
				27	
				30	
				33	
	50+	26.1	99		
				36	
				39	
				42	
	20-1/2	24.9	101	45	
				48	

ORANGE-BROWN VERY SANDY CLAY (CL)
stiff, saturated

ORANGE-BROWN AND GRAY-BROWN SANDY CLAY (CL)
very stiff to hard, saturated, slightly plastic

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LOG OF BORING 5

PLATE 6b

*Converted to Standard Penetration Blow Counts

LOG OF BORING 5

Equipment ROTARY WASH

Elevation _____ Date 1-8-97

Laboratory Test Results or Remarks	Blows/foot *	Moisture Content (%)	Dry Density(pcf)	Depth (ft)	Sample
				48	
	15-1/2	25.6	101		
				51	
				54	
				57	
				60	
				63	
				66	
				69	
				72	

ORANGE-BROWN VERY CLAYEY SAND (SC)
medium dense, saturated

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LOG OF BORING 5

EQUALIZATION POND AND AERATION FACILITY
GUERNEVILLE, CALIFORNIA

PLATE 6C

*Converted to Standard Penetration Blow Counts

▽ ground-water first encountered at time of drilling

LOG OF BORING 6

Equipment ROTARY WASH

Elevation _____ Date 1-8-97

Laboratory Test Results or Remarks	Blows/foot *	Moisture Content (%)	Dry Density(pcf)	Depth (ft)	Sample	
	13-1/2	9.2	117	0		GRAY SANDY GRAVEL (GP) medium dense, wet
	5			3		ORANGE-BROWN CLAYEY GRAVEL (GC) medium dense, wet
	11	19.1	109			becomes more clayey, loose BLUE-GRAY FINE SAND (SP-SM) medium dense, wet
				6		ORANGE-BROWN AND GRAY SANDY CLAY (CL) stiff, wet
Percent Passing No. 200 Sieve = 57.1 TxCU/S = 1380 (3000)	4					DARK GRAY SILTY SAND (SM) loose, wet
				9		ORANGE-BROWN AND DARK GRAY SANDY CLAY (CL) soft, wet, slightly plastic
Percent Passing No. 200 Sieve = 24.5	11			12		BROWN SILTY SAND (SM) medium dense, saturated
				15		becomes more clayey with depth
Percent Passing No. 200 Sieve = 40.8 TxCU/S = 2380 (3400)	11			18		
				21		
Percent Passing No. 200 Sieve = 48.0	10-1/2			24		BROWN VERY CLAYEY FINE SAND (SC) medium dense, saturated

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LOG OF BORING 6

EQUALIZATION POND AND AERATION FACILITY
GUERNEVILLE, CALIFORNIA

PLATE 7a

*Converted to Standard Penetration Blow Counts

▽ ground-water first encountered at time of drilling

LOG OF BORING 6

Equipment ROTARY WASH

Elevation _____ Date 1-8-97

Laboratory Test Results or Remarks	Blows/foot *	Moisture Content (%)	Dry Density(pcf)	Depth (ft)	Sample	
				24		
				27		
				30		ORANGE-BROWN SANDSTONE BEDROCK highly weathered to the consistency of very firm soil
UC(P) = 4500+	50+	17.4	114	33		
				36		
	46	22.9	104	39		
				42		
				45		
				48		

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LOG OF BORING 6

EQUALIZATION POND AND AERATION FACILITY
GUERNEVILLE, CALIFORNIA

PLATE 7b

*Converted to Standard Penetration Blow Counts

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS				TYPICAL NAMES
COARSE GRAINED SOILS (MORE THAN HALF IS LARGER THAN No. 200 SIEVE)	GRAVEL (MORE THAN HALF OF COARSE FRACTION IS LARGER THAN No. 4 SIEVE SIZE)	CLEAN GRAVEL WITH LESS THAN 5% FINES	GW	WELL GRADED GRAVEL, GRAVEL-SAND MIXTURE
			GP	POORLY GRADED GRAVEL, GRAVEL-SAND MIXTURE
		GRAVEL WITH OVER 12% FINES	GM	SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURE
			GC	CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURE
	SAND (MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN No. 4 SIEVE SIZE)	CLEAN SAND WITH LESS THAN 5% FINES	SW	WELL GRADED SAND, GRAVELLY SAND
			SP	POORLY GRADED SAND, GRAVELLY SAND
		SAND WITH OVER 12% FINES	SM	SILTY SAND, GRAVEL-SAND-SILT MIXTURE
			SC	CLAYEY SAND, GRAVEL-SAND-CLAY MIXTURE
FINE GRAINED SOILS (MORE THAN HALF IS SMALLER THAN No. 200 SIEVE)	SILT AND CLAY (LIQUID LIMIT LESS THAN 50)		ML	INORGANIC SILT, ROCK FLOUR, SANDY OR CLAYEY SILT WITH LOW PLASTICITY
			CL	INORGANIC CLAY OF LOW TO MEDIUM PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAY (LEAN)
			OL	ORGANIC CLAY AND ORGANIC SILTY CLAY OF LOW PLASTICITY
	SILT AND CLAY (LIQUID LIMIT GREATER THAN 50)		MH	INORGANIC SILT, MICACEOUS OR DIATOMACIOUS FINE SANDY OR SILTY SOIL, ELASTIC SILT
			CH	INORGANIC CLAY OF HIGH PLASTICITY, GRAVELLY, SANDY OR SILTY CLAY (FAT)
			OH	ORGANIC CLAY OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILT
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

KEY TO TEST DATA

				Shear Strength, psf	Confining Pressure, psf
EI	— Expansion Index	TxUU	— Unconsolidated Undrained Triaxial	320	(2600)
Consol	— Consolidation	TxCU	— Consolidated Undrained Triaxial	320	(2600)
LL	— Liquid Limit (in %)	DSCD	— Consolidated Drained Direct Shear	2750	(2000)
PL	— Plastic Limit (in %)	FVS	— Field Vane Shear	470	
PI	— Plasticity Index	LVS	— Laboratory Vane Shear	700	
SA	— Sieve Analysis	UC	— Unconfined Compression	2000	*
G_s	— Specific Gravity	UC(P)	— Laboratory Penetrometer	700	*
■	"Undisturbed" Sample				
□	Bulk Sample				

Notes: (1) All strength tests on 2.8" or 2.4" diameter samples unless otherwise indicated * Compressive Strength

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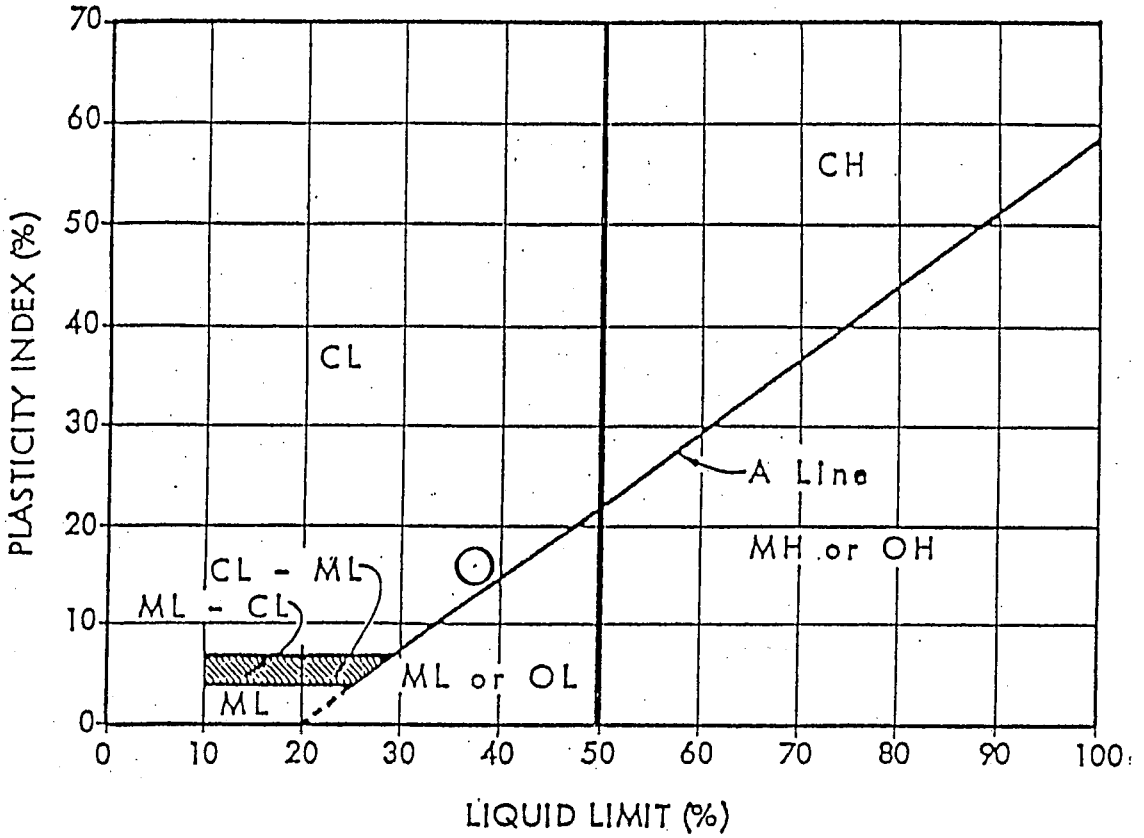
SOIL CLASSIFICATION CHART AND KEY TO TEST DATA

EQUALIZATION POND AND AERATION FACILITY
GUERNEVILLE, CALIFORNIA

PLATE 8



Symbol	Classification and Source	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	% Free Swell
	RED-BROWN SANDY CLAY (CL) Test Boring 4 at 9.0 feet	37	21	16	

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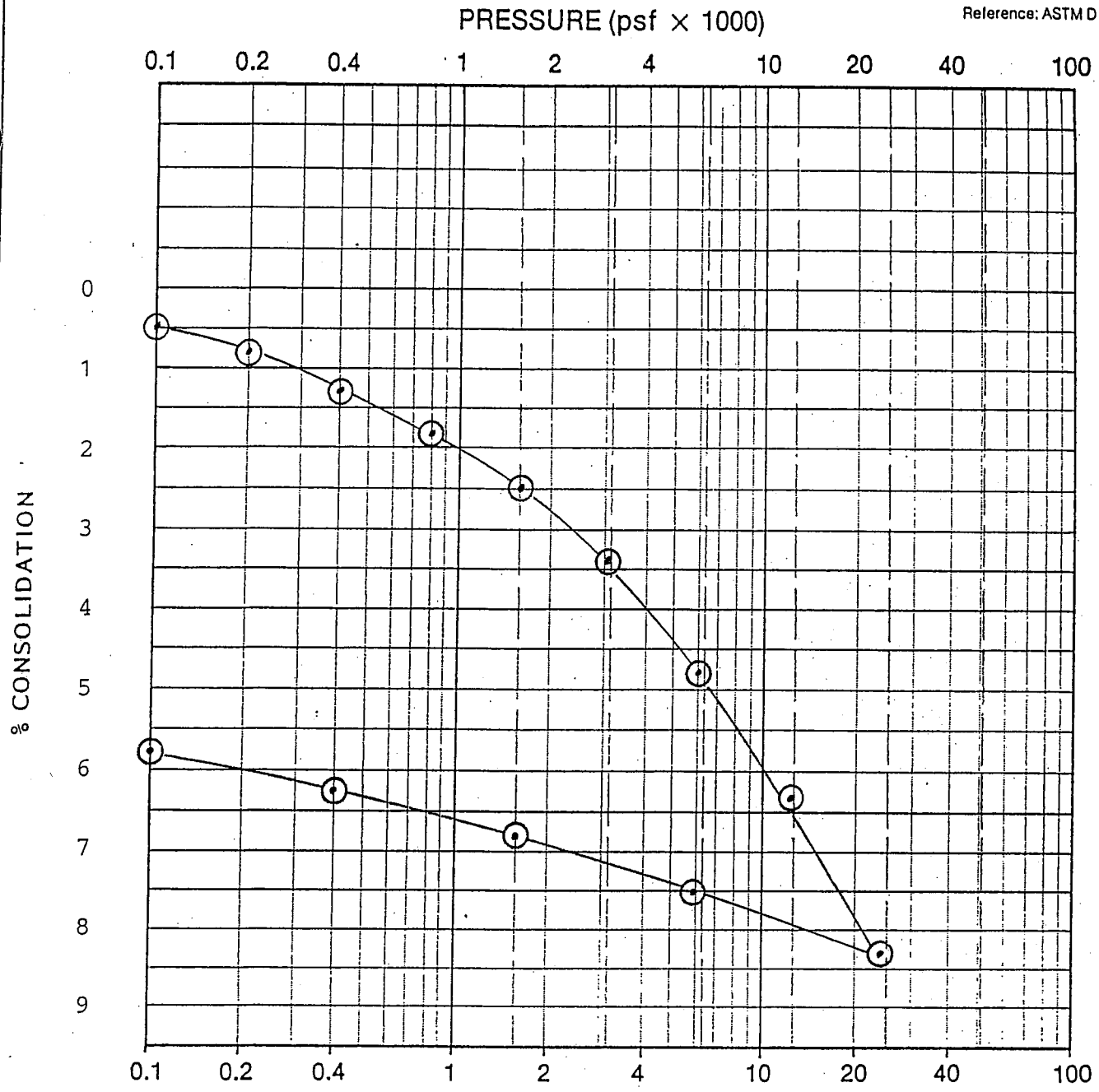
PLASTICITY INDEX TEST RESULTS

EQUALIZATION POND AND AERATION FACILITY
GUERNEVILLE, CALIFORNIA

PLATE 9

Reference: ASTM D 2435



Type of Specimen Undisturbed			Condition		Before Test		After Test	
Diameter (in.) 2.43	Height (in.) 0.80		Water Content	w_o	18.3 %	w_f	15.5 %	
Overburden Press., P_o*		psf	Void Ratio	e_o	0.493	e_f	0.407	
Preconsol. Press., P_c		psf	Saturation	S_o	98 %	S_f	100 %	
Compression Index, $C_{c\,med.}$ 0.06			Dry Density	γ_d	110.8 pcf	γ_d	117.6 pcf	
LL --	PL --	PI --			Gs 2.65			
Classification MOTTLED GRAY-BROWN SILTY VERY FINE SAND (SM)			Source Boring 6 at 22.3 feet					

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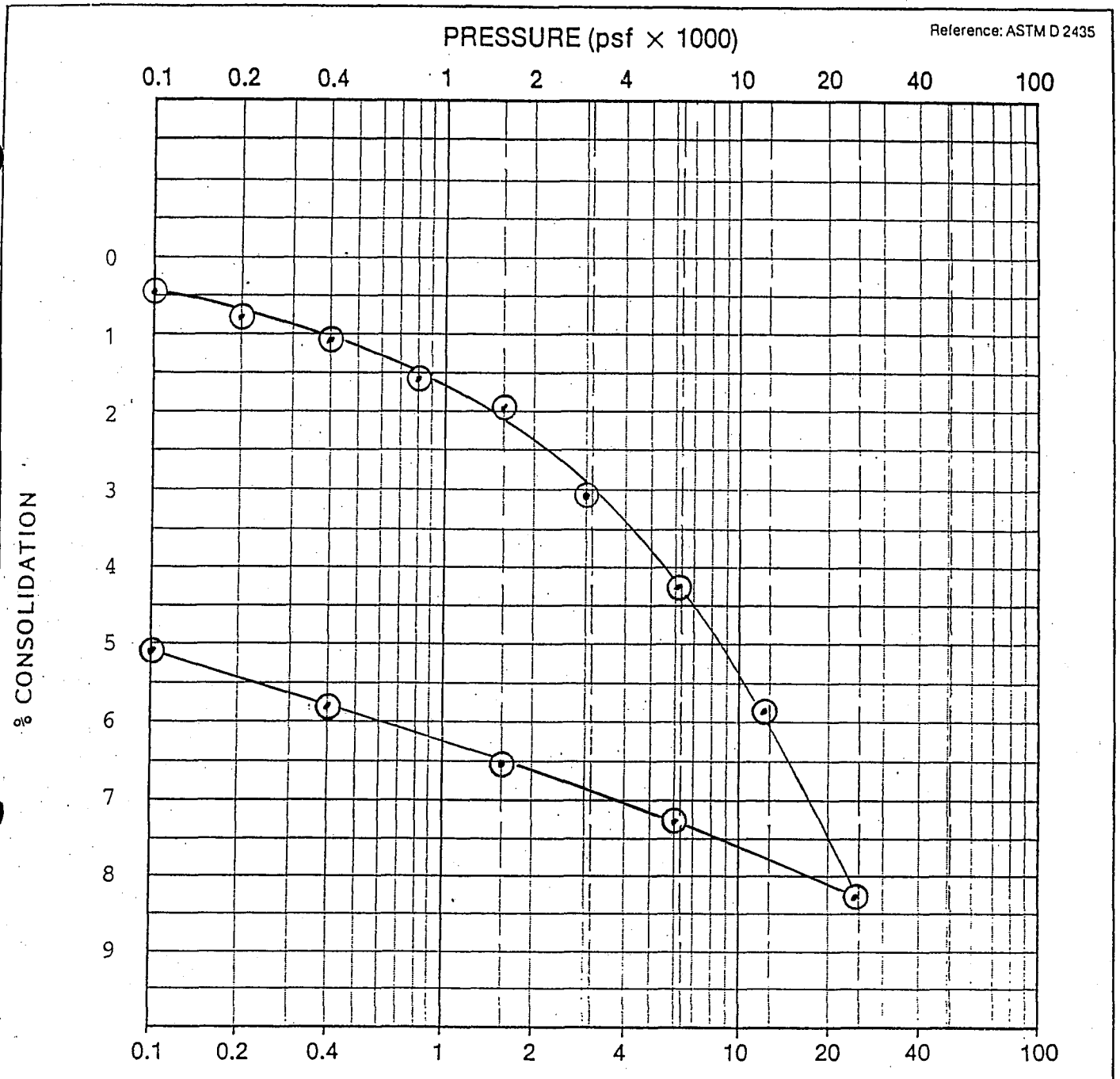
Consolidation Test Report

EQUALIZATION POND AND AERATION FACILITY
GUERNEVILLE, CALIFORNIA

PLATE 10



Type of Specimen Undisturbed		Condition		Before Test		After Test	
Diameter (in.) 2.43	Height (in.) 0.80	Water Content	w_o	15.5 %	w_f	13.9 %	
Overburden Press., P_o	psf	Void Ratio	e_o	0.441	e_f	0.366	
Preconsol. Press., P_c	psf	Saturation	S_o	93 %	S_f	100 %	
Compression Index, C_c med.		Dry Density	γ_d	114.8 pcf	γ_d	121.1 pcf	
LL --	PL --	PI --		Gs 2.65			
Classification BROWN GRAVELLY SANDY CLAY (CL)		Source Boring 6 at 12.0 feet					

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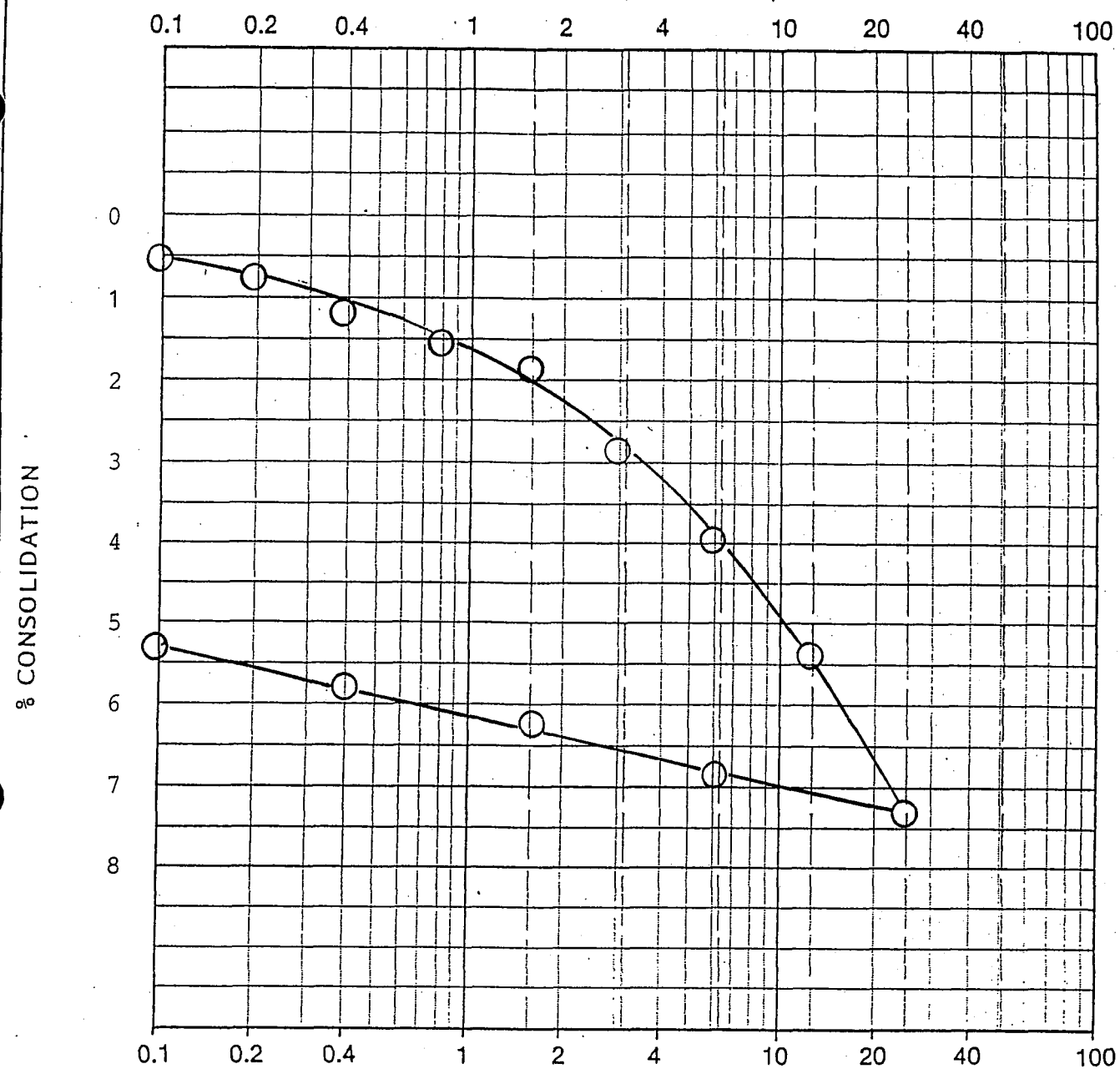
Job No: 205.4.1
Date: 01-31-97
Appr: gkg

Consolidation Test Report

EQUALIZATION POND AND AERATION FACILITY
GUERNEVILLE, CALIFORNIA

PLATE 11

Reference: ASTM D 2435



Type of Specimen Undisturbed		Condition		Before Test		After Test	
Diameter (in.) 2.43	Height (in.) 0.80	Water Content	w_o	14.5 %	w_f	12.9 %	
Overburden Press., P_o	psf	Void Ratio	e_o	0.424	e_f	0.348	
Preconsol. Press., P_c	psf	Saturation	S_o	92 %	S_f	100 %	
Compression Index, $C_{c\,med.}$ 0.08		Dry Density	γ_d	117.5 pcf	γ_d	124.1 pcf	
LL --	PL --	PI --		Gs 2.68			
Classification GRAY GRAVELLY SANDY CLAY (CL)		Source Boring 5 at 7.5 feet					

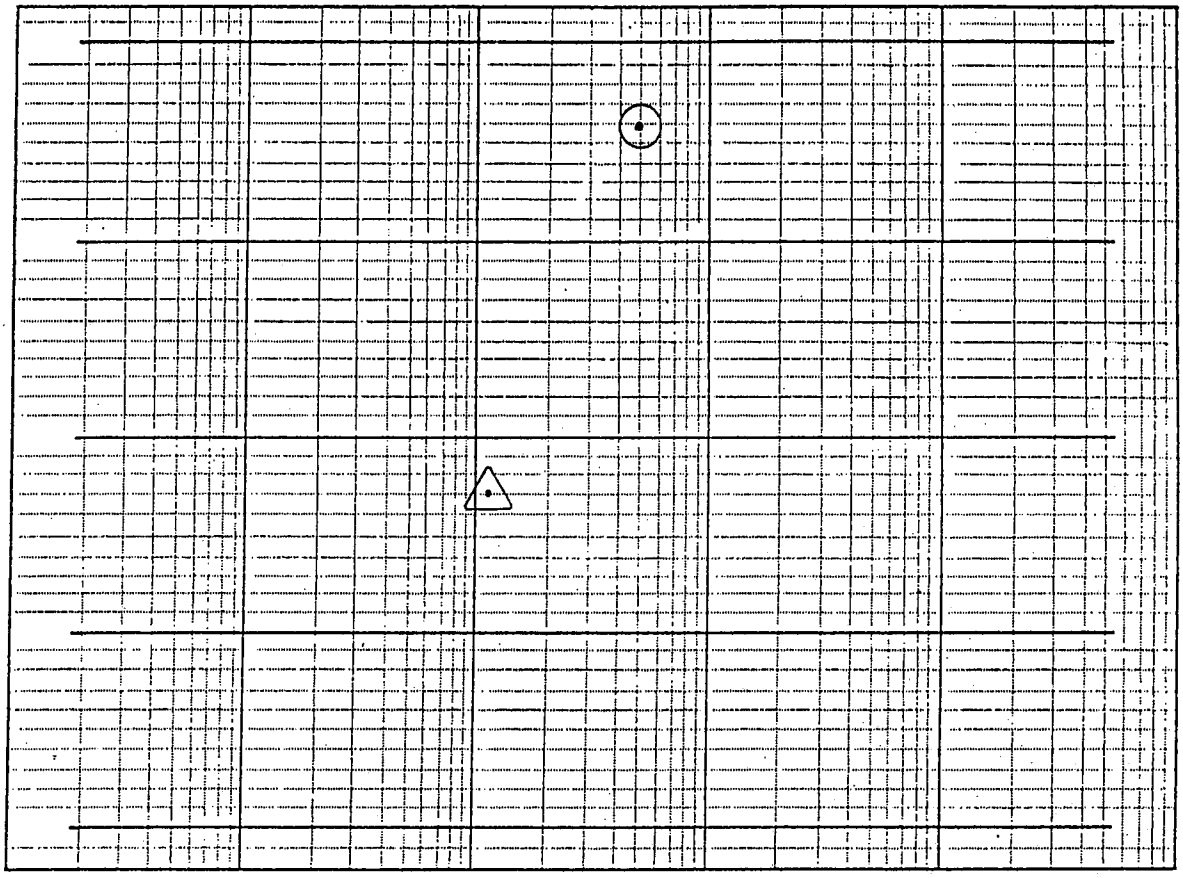
GIBLIN ASSOCIATES
CONSULTING GEOTECHNICAL ENGINEERS

Job No: 205.4.1
Date: 01-31-97
Appr: GKR

Consolidation Test Report

EQUALIZATION POND AND AERATION FACILITY
GUERNEVILLE, CALIFORNIA

PLATE 12



COEFFICIENT OF PERMEABILITY (K) AT 20°C (cm/sec)

PHYSICAL CONDITIONS		TEST NO A ⊙	TEST NO B △	TEST NO C
INITIAL	Diameter (in)	2.43	2.43	
	Height (in)	1.00	0.80	
	Water Content (%)	10.1	13.3	
	Dry Density (pcf)	120.9	113.1	
	Void Ratio	0.393	0.489	
	Saturation (%)	70	73	
FINAL	Consolidation Pressure (psf)	580	580	
	Water Content (%)	15.9	20.4	
	Dry Density (pcf)	117.9	108.6	
	Void Ratio	0.429	0.552	
	Saturation (%)	100	100	
Permeability At 20°C (cm/sec)		4.5×10^{-6}	1.1×10^{-6}	
Sample Source: Boring		2	4	
at 1.5, 3.0, 7.5, 12.5/1.5, 3.0, 7.0, 9.0, 9.5				
Classification:				

TEST TYPE: Falling Head Rising Tail

SATURATION METHOD: Backpressure

Remolded to 92 percent of ASTM D 1557

GIBLIN ASSOCIATES
CONSULTING GEOTECHNICAL ENGINEERS

Job No: 205.4.1

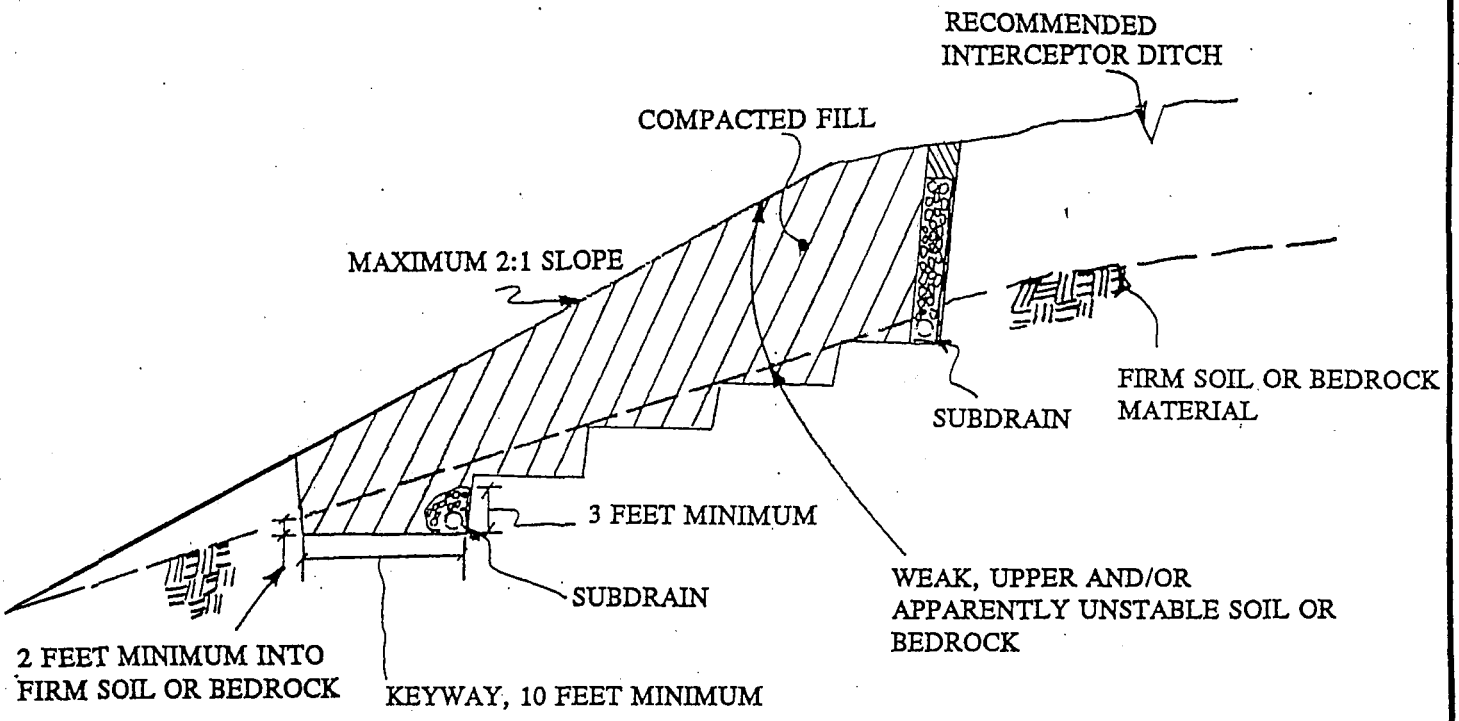
Date: 01-31-97

Appr: GRK

Permeability Test Report

EQUALIZATION POND AND AERATION FACILITY
GUERNEVILLE, CALIFORNIA

PLATE 13



NOTES:

1. Dimensions shown are for estimating purposes. Actual dimensions and extent of keyways, benches, and subdrains will be determined in the field by the soil engineer.
2. The upper 6 inches of soil exposed by excavation should be scarified, moisture conditioned and compacted to at least 90 percent relative compaction.
3. Fill should be placed in thin lifts and similarly compacted.
4. Slopes should be planted with deep-rooted vegetation (or protected by other suitable means) to reduce erosion.
5. Subdrains should consist of 4-inch-diameter perforated, rigid plastic pipe (SDR-35 or equivalent) with a gravity outlet and Class 2 Permeable material, or any drainrock encased in a nonwoven geotextile fabric weighing at least 4 ounces per square yard.

not to scale

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CONSULTING GEOTECHNICAL ENGINEERS

Job No: 205.4.1
Date: 01-31-97
Appr: GKA

TYPICAL CROSS-SECTION
CUT SLOPE BUTTRESS
EQUALIZATION POND AND
AERATION FACILITY
GUERNEVILLE, CALIFORNIA

PLATE
14

GEOTECHNICAL INVESTIGATION REPORT, RUSSIAN RIVER TREATMENT PLANT EXPANSION PROJECT

GIBLIN ASSOCIATES, SEPTEMBER 2002

GIBLIN ASSOCIATES
CONSULTING GEOTECHNICAL ENGINEERS

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Report
Geotechnical Investigation
Russian River Treatment Plant Expansion Project
Sonoma County, California

Prepared for
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271 Turn Pike Drive
Folsom, CA 95630

By

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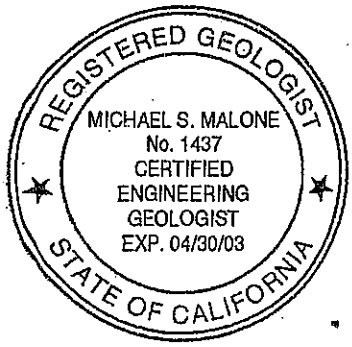

Job No. 3008.1.2
September 6, 2002

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INTRODUCTION

This report presents the results of our geotechnical investigation for the planned Treatment Plant Expansion Project at the existing Russian River County Sanitation District Treatment Plant in Guerneville, California, as shown on the attached Plate 1. The facility is located at the southern terminus of Neeley Road immediately north of the Russian River. We previously performed soil investigations for a proposed Equalization Pond and Aeration Facility (Study Area B) and for the Disposal Expansion project, and the results were summarized in our reports dated April 29, 1997 and January 27, 1997, respectively.

We understand that the currently proposed project will consist of a new Aeration Basin (No. 3) and a Secondary Clarifier (No. 3). The aeration basin is proposed to be located adjacent to the existing Basin No. 2 and will be a below grade reinforced concrete structure comprised of a concrete slab-on-grade floor and perimeter concrete retaining walls. A cover blower building is to be located at the north end of the new basin.

The Secondary Clarifier No. 3 is proposed to be located southeast of Clarifier No. 2. The new clarifier will be a 50-foot diameter circular structure of reinforced concrete construction and will bottom approximately 23 feet below grade. The clarifier is planned in an area of sloping ground.

PURPOSE AND SCOPE

The purpose of our investigation, as outlined in our proposal dated April 18, 2002, was to assess the depth and nature of soil and rock with particular focus on the suitability of site

soils to support the planned structures, the potential for liquefaction near the aeration basin and the stability of both natural and planned slopes affecting the clarifier.

To accomplish the stated purpose, we:

1. Reviewed selected, published, geologic, seismic and geotechnical literature. The literature reviewed is listed in the reference section of this report;

2. Viewed and interpreted stereo-paired air photos of the site and vicinity. Photos viewed are listed in the reference section;

3. Performed a geologic reconnaissance to map the site geology in the project area;

4. Explored subsurface conditions to the extent of four (4) backhoe test pits and two (2) test borings in the areas of the proposed new clarifier and aeration basins;

5. Performed laboratory testing of selected samples of the subsurface materials to determine their physical properties;

6. Performed engineering analyses; and

7. Developed conclusions and recommendations concerning:

    a. Significant geologic hazards affecting the project including slope stability and landslides, liquefaction and proximity of the project to active faults, including appropriate seismic design parameters as outlined in the Uniform Building Code, current edition.

    b. Site preparation and grading.

    c. Foundation support and design criteria.

    d. Support of concrete slab-on-grade floors.

    e. Retaining wall design criteria.

    f. Quality and compaction criteria for development of asphalt-paved areas.

g. Geotechnical drainage.

h. Supplemental geotechnical engineering services.

WORK PERFORMED

On June 11, 2002 our staff geologist was at the facility to perform a reconnaissance of the site, map the site geology, and establish locations of the test pits and borings. Mapped geologic features and approximate locations of the pits and borings are shown on the attached site map, Plate 2. In addition, two cross-sections of the ground surface within the proposed clarifier and aeration basin sites were developed using a hand-level and folding rule. An interpretation of the subsurface soil and rock conditions based on extrapolation of information from our site exploration was superimposed on the cross-sections. The approximate locations of the cross-sections are shown on Plate 2, and the cross-sections are depicted on Plates 10 and 11.

On June 12 and 13, 2002, we explored subsurface conditions to the extent of four test pits and two test borings positioned within the proposed new clarifier and aeration basin areas, respectively. The test pits were excavated to depths ranging from about 7½ to 15 feet with a track-mounted Tackeuchi TB 145 excavator. Our staff geologist and senior engineering geologist observed the excavations and logged the conditions encountered. Samples were obtained from the test pits for visual classification and minor laboratory testing, and in-place strength indicator determinations were conducted in the pit walls with a pocket penetrometer. The borings were drilled to depths of about 38 to 41 feet with truck-mounted auger equipment.

Relatively undisturbed samples were obtained from the borings with a 2½- inch (inside-diameter) split-spoon sampler. The sampler was driven with a 140-pound drop-hammer with a stroke of approximately 30 inches. The blows required to drive the sampler were recorded and converted to equivalent Standard Penetration blow counts for correlation with empirical data. Logs of the test pits and borings showing soil classifications, sample depths and converted blow counts are presented on Plates 3 through 5. The soils are classified in accordance with the Unified Soil Classification System explained on Plate 6. Rock physical characteristics are described on Plate 7.

Selected samples were tested in our laboratory to determine dry density and moisture content, classification (Atterberg Limits, percent free swell, and percent passing No. 200 sieve) and strength characteristics. The test results, including the test pit penetrometer data, are shown on Plate 8. Detailed results of the Atterberg Limits test are presented on Plate 9.

The test pit and boring locations indicated on Plate 2 are approximate and were established by visually estimating from existing surface features. The locations of the test pits and borings should be considered no more accurate than implied by the methods used to establish the data. At the completion of the exploration, the pits were backfilled with the excavated materials and the borings were backfilled with cement slurry.

REGIONAL GEOLOGY

The project area is within the seismically active California Coast Range Province, a region characterized by northwest trending mountain ranges, broad basins and narrow valleys

generally paralleling major geologic structures. Basement rocks include the Jurassic to Cretaceous-age, highly deformed and sheared rocks of the Franciscan Complex. Franciscan rock types include graywacke, shale, chert, greenstone, and serpentinite. The Franciscan rocks exposed at the proposed clarifier site included sheared Franciscan shale (KJfs) and graywacke (KJfss). The various Franciscan rocks exhibit widely varying physical properties ranging from hard and strong to low hardness and weak. Tectonic deformation has affected the Franciscan Complex resulting in dissimilar rock types commonly juxtaposed together by intense shearing.

Weathering and erosion of rock on slopes produces colluvial soil comprised of silt, clay, sand and gravel that accumulate in hillside drainage swales and near the base of the slopes. Soil and rock eroded from upland areas typically accumulates near the base of slopes and along the edge of the valleys as alluvial fan deposits or as alluvium deposited in the valleys. The alluvium is characterized as comprised of poorly consolidated sand, silt, clay and gravel associated with the Russian River (Huffman, 1980).

SITE CONDITIONS

General Site Conditions

The project is located within the Russian River Valley, south of Guerneville, adjacent to the Russian River, as shown on Plate 1. The existing facility is situated near the base of Neeley Hill. Based on the topographic maps, elevations of the property range from approximately 100 to 400 feet above sea level. The project area includes both the lowland

portions of the Russian River Valley and moderate to steep, southwest-facing slopes of Neely Hill. The FIRM map reviewed indicates that the 100-year flood level is located just downslope (south) of the proposed aeration basin site.

SITE GEOLOGY AND SOILS

Clarifier No.3

The proposed Clarifier No.3 is located at the northeast portion of the facility, as shown on the attached Plate 2. The existing clarifiers and the west portion of the planned new clarifier site are located at the terminus and confluence of two south-flowing drainage ravines. The drainage ravines upslope of the clarifiers have moderate to steep gradients that become significantly steeper a short distance upslope from the property boundary. These ravines drain the steep south-facing slopes east of Neely Hill and have previously resulted in debris flows affecting the clarifier and aeration basin areas. The east side of the proposed Clarifier No.3 is located on a moderately steep south-facing slope of a low knoll. Slope inclination ranges vary from about four horizontal feet for every one vertical foot (4:1).

The test pits indicate that, in general, the proposed clarifier area is underlain by discontinuous accumulations of sandy silts and clays and clayey sands with gravels overlying highly weathered and sheared rocks of the Franciscan Complex. Test Pits 2 and 3 were excavated at the base of the moderately inclined slope near the outlet of a drainage ravine. The total soil thickness in the two pits ranged from about 9 to 14 feet thick. The upper 1 to 1½ feet of soil in Test Pit 2 consisted of relatively weak, clayey gravel fills. The upper materials

encountered below the existing fills in Test Pit 2 and exposed at the surface in Test Pit 3 consisted of gravels and angular cobbles (up to 6 inches in diameter) within a clayey matrix. The materials are characteristic of debris flow-type deposits. These materials exhibit a low to possibly moderate expansion potential. That is, the soil would tend to undergo low to possibly moderate strength and volume changes with seasonal moisture variations.

Underlying the debris flow deposits in Test Pits 2 and 3, sandy clay with a significant fraction of gravels and/or cobbles was encountered. The upper several feet of the clays contained an abundance of roots and were noted to be porous. The laboratory tests indicate that these clay soils exhibit a low to possibly moderate expansion potential.

Test Pits 1 and 4 were excavated near the top and base of the low knoll, and the upper soils exposed generally consist of a 1 to 2-foot thick layer of weak, porous sandy clay topsoils with abundant roots and root fibers. The laboratory tests indicate that the topsoil exhibits a low to possibly moderate expansion potential.

Below the topsoils in Test Pit 1, a layer of highly expansive, dark brown, plastic clay was observed to a depth of about 3 feet below ground surface. Below the plastic clay in Test Pit 1 and topsoils in Test Pit 2, residual soils consisting of stiff sandy clay with variable amounts of rock fragments were encountered. The laboratory test data indicates that the residual soils exhibit a moderate expansion potential. The residual soils were observed to extend about 4½ feet below the ground surface.

Franciscan rocks were encountered in all the test pits excavated within the proposed Clarifier No. 3 site. The bedrock was typically highly deformed and sheared and included shale and graywacke. The shale (denoted KJfs) is deeply weathered, crushed and intensely fractured from shearing. The shale exhibits low hardness and weak with numerous irregular undulated smooth fracture surfaces. Shears in the shale were observed to have a steep southwest dip, adverse to the hillside slope. The graywacke was highly weathered, moderately hard and moderately strong and intensely fractured. Bedding was not well defined. A geologic map depicting an interpretation of the site geology is shown on the attached Plate 2.

Aeration Basin No. 3

The Aeration Basin No. 3 site is situated on a gentle south-facing slope with elevations ranging from approximately 170 to 180 feet above sea level. Past grading activities at the existing aeration facilities have been performed and created a relatively level pad for approximately half of the proposed aeration basin as shown on the attached Plate 2. Slope inclinations are gentle to moderate throughout most of the area and are visually estimated to range from about 8 to 9:1.

The borings and laboratory tests indicate that the Aeration Basin No. 3 site is underlain by discontinuous layers of sandy clays with gravels, clayey sands and gravels and sandy clays to the depths explored. The site is blanketed by about 6 to 10 feet of existing fill materials. Fill materials sampled in the borings consist of sandy clays with varying amounts of gravel and rock fragments. Our field and laboratory test data indicates that the fill materials are of

variable density and consistency, and that the clayey fills exhibit a low to possibly moderate expansion potential. The natural soils below the existing fills in the test borings consist of medium dense clayey sands and soft to medium stiff sandy clays with varying amounts of gravel that extend to depths of about 18 to 29 feet. These materials exhibit relatively low to moderate strength and would be considered compressible under the anticipated loading conditions. Below the upper clayey and sandy soils, very stiff to hard sandy clay alluvial soils were encountered that exhibit relative high strength.

GROUNDWATER

Minor seepage was observed in Test Pits 2 and 3, positioned within the clarifier site, near the contact between the soil and sheared shale of the Franciscan Complex at a depth of approximately 10 and 14 feet, respectively, below the ground surface. In Borings 1 and 2, positioned within the aeration basin site, groundwater was initially observed during drilling at depths of about 15 and 16½ below the adjacent ground surface, respectively. The borings were left open for a few hours, and the depth to groundwater was measured at approximately 13 to 14 feet below the adjacent grade.

Groundwater conditions can vary seasonally, and water levels typically rise and fall annually. Groundwater would be expected to saturate porous soils and become perched on top of low permeability soil strata and/or bedrock. Relatively abundant free water would be expected in the more permeable soils. Precise groundwater location, or the presence of a perched water condition, is beyond the scope of this investigation. However, measures to

reduce the potentially negative effects of groundwater on the proposed structures are provided in subsequent sections of this report.

LANDSLIDES AND SLOPE INSTABILITY

Based on our observations and air photo interpretations, possible debris flow paths (denoted as Qc with directional arrows on Plate 2) are present upslope and in a portion of the proposed clarifier area. The extent of the debris flows within the project area is depicted approximately on the attached Plate 2. The test pit data indicates that the depth of debris flow deposits at the proposed clarifier is about 6 feet. During our reconnaissance, we observed a partially buried chain-link fence and metal posts set in concrete that were snapped forward and leveled northeast of the mechanical building. We understand through conversations with facility personnel that during periods of heavy rainfall in 1992, a large debris flow occurred between the mechanical building and Clarifier No. 1, as shown on the attached Plate 2. We understand that the debris extended into the effluent storage reservoir.

FAULTING AND SEISMICITY

The project is within the seismically active California Coast Range geomorphic province. Numerous active faults present in this region are part of the active San Andreas fault system. Faults in this system are characterized as strike-slip faults with a right-lateral sense of displacement that typically trend northwest.

Numerous moderate and occasional large earthquakes have affected the San Francisco Bay Area during historic times, however large historic earthquakes in the North Bay area,

including the project vicinity, have been relatively infrequent. The most notable large earthquake to affect the project vicinity was the great California earthquake of 1906 with its epicenter located near the town of Olema in Marin County. Historic records indicate the 1906 earthquake produced strong ground shaking in the project vicinity and resulted in liquefaction and lateral spread in the Russian River alluvium. Near Duncan's Mills, the Russian River alluvium was affected by liquefaction and lateral spread during strong earthquake shaking during the 1906 earthquake. In that event, extensive ground cracking and sand boils occurred 200-250 feet back from the river (Youd, 1978).

Despite the historic infrequency of large magnitude earthquakes in the North Bay area, recent studies indicate the San Andreas, Rodgers Creek and Maacama faults are capable of generating large earthquakes in the future.

DISCUSSION AND CONCLUSIONS

Based on the results of our field exploration, laboratory tests, engineering analyses and our experience with similar soil conditions at nearby sites, we conclude that, the project is feasible from a geotechnical engineering standpoint, and the sites can be used for the proposed construction. The most significant geotechnical and geologic factors affecting the design and construction of the proposed clarifier and aeration basin are as follows:

Clarifier No. 3

1. Slope instability and debris flows
2. Existing fills and weak, compressible topsoils

3. Plastic clayey soils of moderate to high expansion potential

4. Weak and/or plastic clayey soils overlying weathered bedrock materials on sloping terrain

5. Potential excavation difficulties associated with the presence of hard bedrock and/or boulders

6. Potential for strong seismic ground shaking.

Aeration Basin No. 3

1. Weak, compressible fills and underlying alluvial soils of low to moderate strength

2. Potentially high groundwater levels and the presence of granular soils subject to caving and/or slumping during site excavation work

3. Potential for strong seismic shaking

SLOPE INSTABILITY AND DEBRIS FLOWS

Based on our observations, air photo interpretation, and conversations with employees at the treatment facility regarding past debris flow events at the site, we conclude that future debris flow hazards affect the clarifier site. Debris flows are relatively rapidly moving mixtures of saturated soil and rock debris. Debris flows pose a hazard to personnel and structures at the time they occur, as well as depositing loose accumulations of soil subject to compressibility under future loading conditions.

To reduce the potential for future debris flows to damage the proposed Clarifier No. 3, the upslope side of the clarifier walls could be extended at least 4 feet above the adjacent ground surface to deflect future flows and reduce the risk of debris potentially entering the clarifier. As an alternative, a separate debris fence and/or deflection structure could be installed upslope of the clarifier. However, any device used to catch or deflect debris will need routine maintenance and debris removal.

It should be recognized that any improvements placed within the area of debris flows may be subject to future damage and/or higher than normal levels of maintenance. We observed during our site reconnaissance that rough graded gravel roadways are present upslope of the clarifier area, beyond the subject site. It appears that surface drainage from the road is presently collected in culverts that outlet to natural drainage courses upslope of the clarifier area. The concentration of such runoff into natural drainage courses could increase the risk of debris flow. To reduce, but not eliminate, the impact of debris flows, measures will be needed to help collect precipitation and accompanying runoff upslope of the clarifier site into pipelines that discharge downslope of site improvements into existing drainage facilities.

SOIL CREEP

Our experience indicates that where weak soils or rock and plastic clayey soils are on a slope, the materials are subject to creep (a slow, long-term, gradual downhill movement under the influence of gravity). This phenomenon is common on hillsides in Sonoma County. Our experience indicates that distress to foundations and slabs supported on materials subject to

creep can result in distress in the form of vertical and/or lateral displacements and/or more-than-normal cracking. Accordingly, we judge that design of foundations and concrete slabs on sloping terrain would need to recognize the presence of weak and/or plastic creep-affected materials, as subsequently recommended.

ROCK EXCAVATION

A range of different rock and soil conditions are present within the proposed clarifier site. Rocks of the Franciscan Complex can vary over short distances from hard and strong to weak. Consequently, relatively soft and hard excavation conditions may be encountered in the clarifier excavation. Hard/strong materials, if encountered, could be resistant to excavation using conventional equipment, especially in confined excavations such as footing and utility trenches. Jack-hammering and/or the use of a "hoe-ram" equipment may be needed.

Potentially unstable conditions could be encountered during rock excavation due to the potential to expose adverse planes of weakness related to bedding surfaces and/or fractures and shears. Slopes excavated and subjected to periods of wet weather and/or long periods of time without support would be expected to experience increased instability.

BASIN EXCAVATION

The test borings encountered granular soils that could be subject to caving during excavation of the Aeration Basin No. 2. Accordingly, the possible need for temporary shoring during construction should be recognized.

HIGH GROUNDWATER

Groundwater was encountered in both test borings during our exploration at depths from about 14 to 15 feet at the aeration basin. However, we judge that it would be prudent to assume that the groundwater table beneath the aeration basin site could potentially rise to within about 6 feet of the existing ground surface, as indicated on the attached Plate 11. Accordingly, design of below-grade retaining walls and floor slabs for the aeration basin should recognize the potential for groundwater to rise to the indicated level, and measures should be implemented into the design to help mitigate potential detrimental effects. Such measures typically include installation of retaining wall backdrain systems and/or subsurface drainage facilities beneath the concrete floor slab, installation of wells to locally lower the groundwater table, waterproofing of building elements where migration of moisture would be detrimental, and/or designing of structural elements to resist hydrostatic pressures. However, because a suitable gravity outlet for subsurface water may not be available during periods of high water levels, the use of wall backdrains and/or underslab subdrains may not be suitable. Also, lowering of the groundwater table could result in localized distress to existing nearby structures. Accordingly, we conclude designing of the below-grade structures for hydrostatic pressures would be the most suitable alternative. We could be consulted regarding other proposed measures, if requested.

FILLS AND COMPRESSIBLE SOILS

We could find no evidence during our exploration to indicate that the existing fills encountered at the proposed clarifier and aeration basin sites were properly placed and compacted under soil engineering observation and testing services. Our experience indicates that such fills, if not properly placed and compacted, could undergo total and/or differential settlement when subjected to new loads. Also, we judge that the weak, natural topsoils would similarly be subject to significant settlements when saturated under load. Accordingly, we conclude that the existing fills and weak natural topsoils would not be suitable for foundation, slab or fill support in their current condition.

The materials encountered beneath the aeration basin site in our test borings between depths about 6 to 18 feet (Boring 1) and 10 to 28 feet (Boring 2) generally consist of saturated clays, sands and gravels that exhibit variable strength characteristics. We believe that such soils of variable thickness and strength/compressibility characteristics would result in differential supporting conditions beneath the aeration basin, increasing the risk of unacceptable total and/or differential foundation settlements. To reduce the risk of total and/or differential foundation settlements, we conclude that it will be necessary to provide a pad of compacted fill beneath the basin foundations and floor slabs to help redistribute foundation loads and provide more uniform supporting conditions. Specific recommendations for the depth and extent of the compacted fill pad beneath the basin is discussed in subsequent sections of this report.

The cross-section shown on Plate 10 through the proposed Clarifier No. 3 site indicates that the materials exposed after excavation would likely consist of relatively firm bedrock transitioning to weak upper and/or residual soils and compressible debris flow deposits. To reduce the risk of differential settlement and resultant distress, we judge that overexcavation of compressible materials within the clarifier building area would be needed where planned excavations do not remove materials for their full depth. Because firm bedrock will likely be exposed in a portion of the pad, we conclude that the overexcavated areas would then need to be backfilled with relatively high strength materials of low compressibility to help provide more uniform supporting conditions.

EXPANSIVE CLAYS

Expansive clayey soils can shrink and swell with seasonal variation in moisture content, potentially resulting in distress to foundations and slabs in the form of heave, settlement, and/or more-than-normal cracking. Therefore, we conclude that foundations would need to bottom on firm material below expansive clayey soils and/or the zone of significant seasonal moisture variation, as subsequently recommended. Also, where future distress to concrete slabs-on-grade resulting from expansive soil movements would be unacceptable, slabs would need to be underlain by a pad of compacted fill of low expansion potential, or designed as structural slabs supported on foundation elements. Where minor slab movements and resultant distress would be acceptable, the slabs could be supported directly on the site soils, provided the slabs are structurally separated from adjacent foundations.

FOUNDATIONS AND CONCRETE FLOOR SLABS

Satisfactory foundation support for the structures can be obtained from spread footings bottomed on firm underlying soil or bedrock materials or properly compacted fill. For pads constructed and foundations designed and installed in accordance with our recommendations, we judge that total settlement will be about 1-inch or less. A portion of the settlement will occur during construction. However, because the underlying materials are clayey, some of the settlements will occur over a several year period.

We conclude that concrete slab-on-grade floors can be used in both the clarifier and aeration structures, as proposed. However, to reduce the risk of future distress to the floor slabs, the floor slabs would need to be underlain by firm natural materials or approved on-site or imported fill materials that exhibit low expansion potential. Where expansive clay soils are exposed at slab subgrade elevation, the materials would need to be overexcavated so as to provide space for the recommended pad of on-site or imported fill of low expansion potential. In addition, any expansive clayey soils exposed would need to be moisture conditioned so as to preswell the material, and maintained in a fully swelled condition until overlying fills or concrete floor slabs are cast as subsequently recommended.

FLOOD HAZARD

Our review of flood prone area maps indicates that the 100-year flood level is located just downslope (south) of the proposed aeration basin site. It should be understood that flood studies are ongoing and there is an inherent risk adjacent to rivers. Such flood levels are

difficult to predict and may fluctuate with time. The margins of the 100-year flood plane are in a constant state of flux as new data is added to the analysis every year and watershed conditions change (Mount, 1995).

SEISMIC HAZARDS

Fault Surface Rupture

Fault surface rupture is considered most likely to occur along pre-existing planes of weakness in the earth's crust. Although fault surface rupture does occasionally occur along old, inactive fault traces, bedding planes or even through previously unfaulted areas, ruptures most frequently occur in close association with geologically young fault zones (faults experiencing displacement within the past 11,000 years). No recognized active faults are within the project area and no evidence for recent faulting was observed during this investigation. Consequently, it is concluded that the potential for fault surface rupture to affect the project is low.

Ground Shaking

There is a high potential that very strong seismic ground shaking will affect the project site during the life of the project due to the site's proximity to major active faults in the region. The intensity of shaking at the site will depend on the distance to the earthquake epicenter, depth and magnitude of the epicenter, and the response characteristics of the materials beneath the site. Our investigation indicates highly weathered and sheared bedrock materials of the

Franciscan Complex underlie the clarifier site. Bedrock at or near the ground surface generally tends to reduce amplification of seismic ground motions at a site. Consequently, we conclude that S_C is the appropriate Soil Profile Type for the clarifier site, as described in the 1997 UBC, Table 16-J.

The proposed Aeration Basin No. 3 is underlain by deep, compressible soils. Therefore, we judge that the soil conditions at the site are approximately comparable to the UBC Soil Profile Type "S_d".

The table below provides a summary of the closest recognized active faults to the project site, approximate distances and direction from the subject site to the respective fault, maximum earthquake magnitudes and current Uniform Building Code (UBC) seismic source type designation.

Fault Name	Source Type	Approximate Distance To Site	General Direction (Site to Source)
Maacama (south)	B	27 kilometers	Northeast
Rodgers Creek	A	20.3 kilometers	Northeast
San Andreas (1906)	A	13.5 kilometers	Southwest

Liquefaction and Lateral Spread

Liquefaction, densification, and lateral spread are phenomena that are typically induced by strong earthquakes from major faults, such as those in the region including the San

Andreas, the Maacama and the Rodgers Creek-Healdsburg faults. Surface cracking and significant subsidence can result from soil liquefaction or densification during strong earthquake-shaking. Liquefaction, a loss in shear strength, and densification, a reduction in void ratio, are phenomena associated with loose, sandy soil deposits subjected to ground shaking during earthquakes. Other phenomena associated with strong ground shaking at sites near slopes are lateral spreading and soil lurching. Lateral spreading is a horizontal slumping generally downslope, and lurching is a virtually instantaneous lateral displacement of a soil mass out of a slope.

During our previous work at the facility we analyzed the soil data from test borings drilled within the previously proposed Equalization Pond site in accordance with the "*Simplified Procedure for Evaluating Soil Liquefaction Potential*" by H. B. Seed and I. M. Idriss, published in the Journal of the Soil Mechanics and Foundation Division of the American Society of Civil Engineers, dated September 1971, and subsequent papers by Seed and others, published in 1985. We concluded that portions of the underlying loose, sandy soils encountered at a distance of approximately 50 feet west of the currently proposed Aeration Basin No. 3 site could be subject to liquefaction and/or densification during strong ground shaking. Based on the data from our recent test borings, we judge that the granular soils underlying the currently proposed Aeration Basin No. 3 site contain a sufficient amount of fines such that the risk of liquefaction and/or densification could be considered low. Whether

such phenomena would actually occur depends on complicated factors, such as intensity and duration of ground shaking at the site and underlying soil and groundwater conditions.

Should liquefaction, densification or lateral soil movements occur in the area previously explored west of the basin site, we believe that, provided the site is prepared and foundations design in accordance with our subsequent recommendations, the risk of future distress to the aeration basin would be relatively low. We judge that the use of ground modification techniques, such as injection grouting or stone columns, would further reduce the risk of such potential distress should these phenomena occur. We could be consulted to develop specific recommendations for such additional measures, if desired.

RECOMMENDATIONS

SITE GRADING

Areas to be graded should be cleared of dense growths of grass and vegetation and stripped of the upper soils containing root growth and organic matter. We anticipate that the depth of stripping, where needed will average about 3 inches. The strippings should be removed from the site or stockpiled for reuse in landscaping areas.

Wells, septic tanks, or other underground obstructions encountered during grading should be removed or abandoned in place. The resultant voids should be backfilled with soil or granular material that is properly compacted, as subsequently discussed, or capped with concrete. The method of removal/abandonment and void backfilling should be determined by the appropriate governing agency and/or the soil engineer.

After stripping, excavation can be performed as necessary. We anticipate that, with the exception of organic matter and rocks or hard fragments larger than four inches in diameter, the excavated materials, in general, will be suitable for reuse as compacted fill. However, expansive clayey soils should not be reused as fill within the upper 24 inches of building pad areas, unless thoroughly mixed with other materials to satisfactorily reduce shrink/swell characteristics. Also, fills placed in the clarifier foundation and floor slab areas should consist of approved materials of high strength and low compressibility, as outlined below.

Imported fill, if used, should be of low expansion potential and have a Plasticity Index of 13 or less. Imported fill material should be free of organic matter and rocks or hard fragments larger than 4 inches in diameter. Imported fill should be tested and approved by the soil engineer prior to transporting the materials to the site.

Clarifier Pad Preparation

Within the proposed clarifier area and extending to at least 5 feet beyond the perimeter and 3 feet beyond adjacent exterior concrete walkway slabs (building envelope), existing fills, weak upper topsoils, compressible debris flow deposits and/or expansive clays not removed by planned excavations should be overexcavated so as to expose firm bedrock. We anticipate that overexcavations will be needed in the western portion of the clarifier, and will vary in depth to about 10 feet below the existing ground surface. The actual depth and extent of overexcavation of compressible and/or expansive clayey soils could vary, and should be determined in the field by the soil engineer. Overexcavated areas of the clarifier pad then

should be backfilled with properly compacted rock-like materials that simulate the firm bedrock condition of the balance of the clarifier pad. Approved on-site granular soils containing rock and less than about 40% fines or imported aggregate base materials could be used to refill the overexcavations, but must be treated with at least five percent Portland cement (by weight) to improve the supporting capacity of the fill. As an alternative, lean concrete could be used. The clarifier pad fill should be placed in 8-inch thick loose layers, moisture conditioned to or near optimum and compacted to at least 95 percent relative compaction. The finish surface should be rolled with a heavy, smooth-wheeled roller to achieve at least 95 percent relative compaction.[1]

Aeration Basin Pad Preparation

Within the aeration basin building envelope, existing fills and weak, upper porous natural soils should be overexcavated for their full depth. The depth of excavations should then be adjusted to provide space for at least 24 and 36 inches of compacted fill below the bottom of all footings and floor slabs, respectively, with no more than a 5-foot differential thickness of fill below footings across the structure. In areas to receive fill, the surfaces exposed by stripping or soil removal should be prepared by scarifying to a depth of at least 6 inches, moisture conditioning to near optimum and compacting to at least 90 percent relative compaction. Approved on-site or imported nonexpansive fill materials then should be spread

1 Relative compaction refers to the in-place dry density of fill expressed as a percentage of maximum dry density of the same material determined in accordance with the ASTM 1557-91 laboratory compaction test procedure. Optimum moisture content refers to the moisture content at maximum dry density.

in 8-inch thick loose lifts, moisture conditioned to near optimum and compacted to at least 90 percent relative compaction.

Because of potentially high groundwater levels, we judge that there is a risk that saturated, unstable soil conditions could be encountered at the bottom of the recommended overexcavation. Site grading with heavy equipment, particularly heavy rubber-tired equipment, could induce instability in the underlying soils. Accordingly, we suggest that the site be graded with lightweight equipment. Also, high groundwater levels could increase the potential for excavation bank instability, and measures to stabilize and/or strengthen the bottom of the overexcavation may be needed to facilitate compaction of subsequent fill and completion of the building pad. We recommend that the contract documents contain provisions to account for the possible need for temporary excavation shoring, additional processing, geotextile fabrics, geogrids, dewatering or other stabilization measures.

SLOPE CRITERIA

In general, finish cut and fill slopes should be inclined no steeper than 2:1. We recommend that cut slopes, if any, be observed by the geotechnical engineer and/or engineering geologist during site grading to evaluate the need for modifications to cut slope inclinations or other measures to reduce the risk of future slope instability.

The face of finish fill slopes should be thoroughly compacted by slope rolling and trimming or constructed wider than planned and then trimmed to expose dense, well compacted material.

FOUNDATIONS

Spread footings can be used for foundation support of the aeration basin and clarifier. In general, footings should be no less than 12 inches wide and should bottom on firm underlying natural soil or bedrock and/or properly compacted fill materials at least 12 inches below lowest adjacent grade. Spread footings for the aeration basin should be underlain by at least 24 inches of properly compacted fill and can be designed to impose dead plus code live load and total design load (including wind or seismic forces) bearing pressures of 2,000 and 3,000 pounds per square foot (psf), respectively. Footings for the clarifier should bear on either firm underlying bedrock or properly compacted fill materials mixed with Portland cement. Such footings can be designed to imposed dead plus code live load and total design load bearing pressures of 3,500 and 4,5000 psf, respectively.

Resistance to lateral loads can be obtained from passive earth pressures and soil friction. We recommend the following criteria for design:

Passive Earth Pressure	=	300 pounds per cubic foot (pcf) equivalent fluid, neglect the upper 1-foot, unless confined by pavement or slab
Soil Friction Factor	=	0.30

RETAINING WALLS

Retaining walls that are free to rotate slightly and support level (and up to 3:1) backfill should be designed to resist an active equivalent fluid pressure of about 45 pcf acting in a

triangular pressure distribution. Where the backfill slope is steeper than 3:1, the pressure should be increased to about 65 pcf. If the wall is constrained at the top and cannot tilt, the design pressures for level and sloping backfill should be increased to about 60 and 80 pcf, respectively. Where full backdrainage behind retaining walls would not be available during periods of high groundwater, such as is anticipated at the aeration basin, the portion of the walls below the groundwater table should be designed to resist hydrostatic pressures using equivalent fluid pressures of 85 pcf and 93 pcf for cantilever and constrained walls, respectively. Where retaining walls are subjected to vehicular traffic, the walls should be designed to resist an added surcharge pressure equivalent to about 1½ feet of additional backfill.

Retaining wall foundations should be designed in accordance with the recommendations outlined in the previous section of this report.

Retaining walls that are not designed for hydrostatic pressures should be fully backdrained. The backdrains should consist of 4-inch diameter, perforated rigid plastic pipe sloped to drain to outlets by gravity and clean, washed, free-draining crushed rock or gravel (drainrock). The crushed rock or gravel should extend to within about 1 foot of the surface. The drainrock should be covered and separated from the soil bank by a nonwoven, geotextile fabric, such as Mirafi 140N, or equivalent weighing at least 4 ounces per square yard. The upper 1-foot should be backfilled with compacted soil to inhibit surface water infiltration unless capped with a concrete slab.

The ground surface behind retaining walls should be sloped to drain. Where migration of moisture through walls would be detrimental, the walls should be waterproofed.

SLAB-ON-GRADE

Provided the sites are prepared as recommended above, floor slab areas should be underlain by a properly graded pad consisting of firm bedrock materials and/or compacted, approved on-site or imported fill materials of low expansion potential.

In general, slabs should be underlain with a capillary moisture break and cushion layer consisting of at least 4 inches of free-draining gravel or crushed rock (slab rock). Prior to placing the reinforcing or slab rock, the subgrade soils should be thoroughly moistened and be smooth, firm and uniform.

Moisture vapor will condense on the underside of slabs. Where migration of moisture vapor through slabs is detrimental, an impermeable moisture vapor barrier should be provided between the drainrock and the slabs. Two inches of clean, moist sand should be provided between the free-draining rock and the slab. Slabs should be about 4 inches thick and be reinforced to reduce cracking. Actual slab thickness and amount and type of reinforcing should be determined by the structural engineer.

GEOTECHNICAL DRAINAGE

Ponding water will cause softening of the site soils and could be detrimental to foundations. It is important that the sites be sloped to drain away from foundations. The roof,

if any, should be provided with gutters, and the downspouts should be connected to nonperforated pipelines that discharge to planned or existing drainage facilities.

Roof downspouts, if any, and surface drains must be maintained entirely separate from subdrains and retaining wall backdrains.

SUPPLEMENTAL SERVICES

We should review final grading plans, foundation plans, and surface and subsurface drainage details for conformance with the intent of our recommendations. During site grading operations, we should provide intermittent observation and testing. We should establish the actual depth and extent of the fill placement and compaction, observe needed excavations, and modify our recommendations, if warranted. Field and laboratory tests should be performed to ascertain that the recommended moisture content and degree of compaction are being attained.

During installation of foundations and subdrains, we should observe the work in-progress to verify that the conditions encountered are as anticipated and to modify our recommendations, if needed.

MAINTENANCE

Periodic land maintenance will be required. Drains should be checked regularly and cleaned and maintained as necessary. A dense growth of deep-rooted, fast-growing ground cover should be established and maintained on all graded slopes. Sloughing, erosion or sliding is common on newly graded slopes, especially during the first few winters. Therefore,

supplemental erosion inhibitors such as jute mesh or other commercially available materials may be prudent to apply. Any such sloughing, erosion or sliding that does occur should be repaired promptly before it can enlarge.

LIMITATIONS

We have performed the investigation and prepared this report in accordance with generally accepted standards of the soil engineering profession. No warranty, either express or implied, is given.

Subsurface conditions are complex and may differ from those indicated by surface features or encountered at test pit and boring locations. Therefore, variations in subsurface conditions not indicated on the logs could be encountered.

If the project is revised or if conditions different from those described in this report are encountered during construction, we should be notified immediately so that we can take timely action to modify our recommendations, if warranted.

Supplemental services, as recommended herein, are performed on an as-requested basis. We accept no responsibility for items we are not notified to check, or for use and/or interpretation by others of the information contained herein. Such services are in addition to this investigation and are charged for on an hourly basis in accordance with our Standard Schedule of Charges.

Site conditions and standards of practice change. Therefore, we should be notified to update this report if construction is not performed within 24 months.

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Plate 8	Laboratory Test Data
Plate 9	Plasticity Index Test Results
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Plate 11	Cross-Section Proposed Aeration Basin No.3

DISTRIBUTION

Copies Submitted: 5

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271 Turn Pike Drive
Folsom, CA 95630
Attention: Craig Olson

BFP/JKR.sc/NN/HD/bound/bfp/Job No. 3008.1.2

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Air Photos

5-18-71, Nos. 3088-394& 428, black & white

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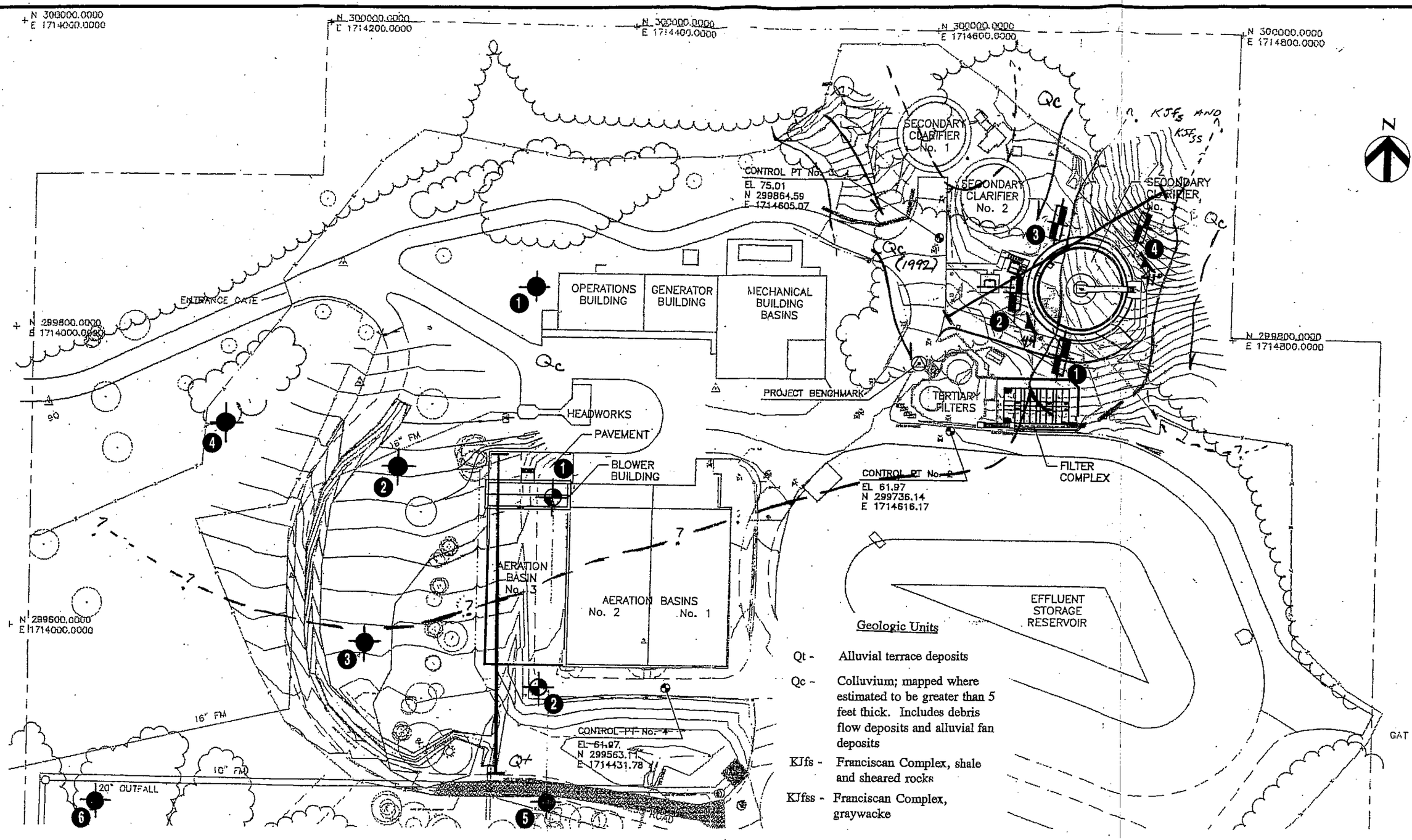
PROJECT LOCATION MAP

RUSSIAN RIVER
TREATMENT PLANT
SONOMA COUNTY, CALIFORNIA

PLATE

1



Geologic Units

- Qt - Alluvial terrace deposits
- Qc - Colluvium; mapped where estimated to be greater than 5 feet thick. Includes debris flow deposits and alluvial fan deposits
- KJfs - Franciscan Complex, shale and sheared rocks
- KJfss - Franciscan Complex, graywacke

Symbols

- Approximate Test Boring Location
- Approximate Test Boring Location (Giblin Associates, 1997)
- Approximate Test Pit Location
- APPROXIMATE CROSS-SECTION LOCATION
- Geologic contact; dashed where approximate
- Possible debris flow path; approximate

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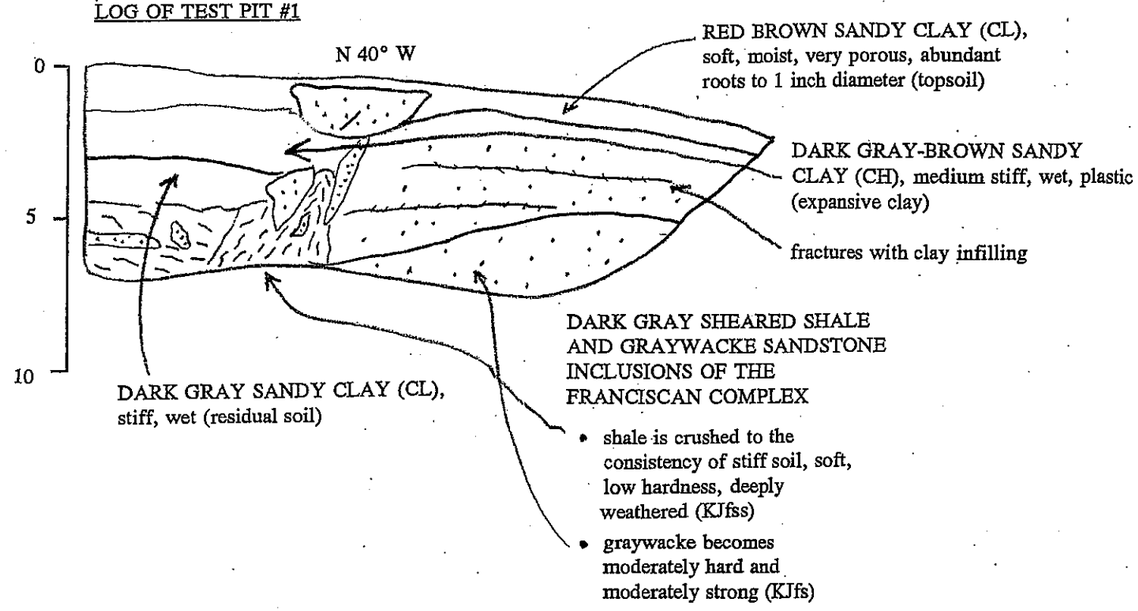
GEOLOGY MAP OF THE BUILDING AREAS AND TEST PIT AND BORINGS LOCATION PLAN

RUSSIAN RIVER TREATMENT PLANT
SONOMA COUNTY, CALIFORNIA

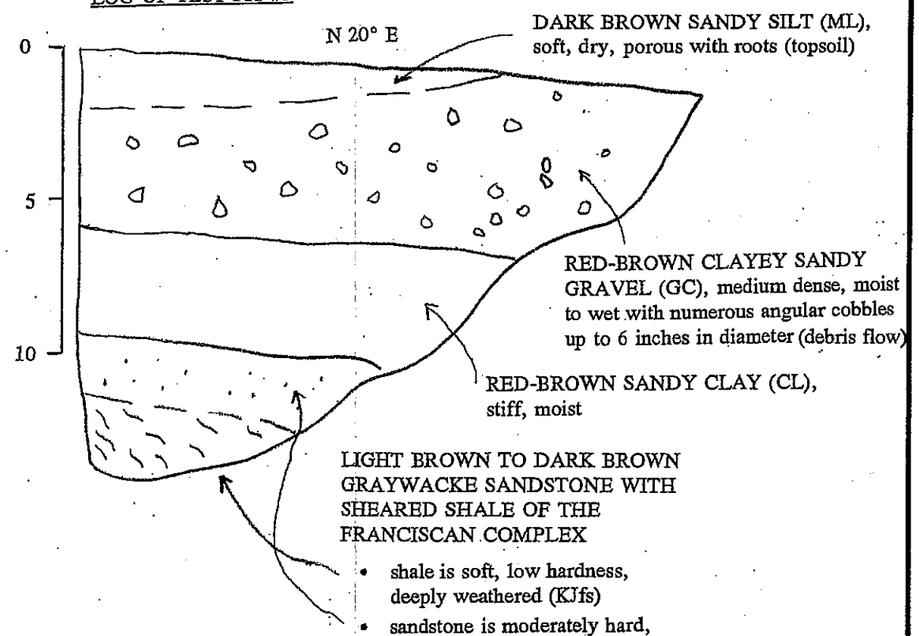
PLATE 2

LOG OF TEST PIT #1



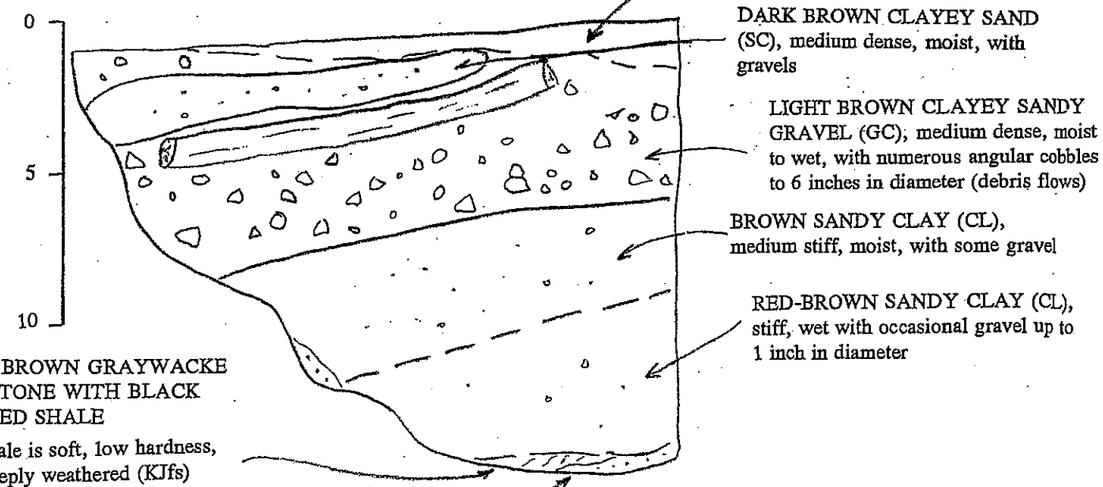
- shale is crushed to the consistency of stiff soil, soft, low hardness, deeply weathered (KJfss)
- graywacke becomes moderately hard and moderately strong (KJfs)

LOG OF TEST PIT #3



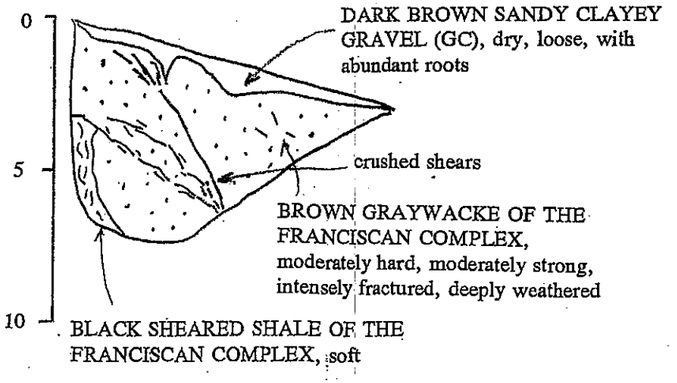
- shale is soft, low hardness, deeply weathered (KJfs)
- sandstone is moderately hard, friable, highly weathered (KJfss)

LOG OF TEST PIT #2



- shale is soft, low hardness, deeply weathered (KJfs)
- sandstone is moderately hard, moderately strong, highly weathered (KJfss)

LOG OF TEST PIT #4



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LOGS OF TEST PITS 1 THROUGH 4

RUSSIAN RIVER TREATMENT PLANT
SONOMA COUNTY, CALIFORNIA

PLATE 3

▽ groundwater first encountered at time of drilling

▼ groundwater at time of backfilling

LOG OF BORING 1

Equipment 6" FLIGHT AUGER

Elevation _____ Date 6-13-02

Laboratory Test Results or Remarks	Blows/foot *	Moisture Content (%)	Dry Density(pcf)	Depth (ft)	Sample	
				0		1 inch asphalt pavement
						GRAY SANDY GRAVEL (GP), dense, moist (Class II Aggregate Base)
Percent Free Swell = 25	8	12.8	117	2		BROWN SANDY CLAY (CL), moist, medium stiff, with very occasional subangular gravels (fill)
Percent Free Swell = 30	26	12.6	122	4		GRAY SANDY CLAYEY GRAVEL (GC), dense, moist, with wood fragments (fill)
Percent Free Swell = 50	20	11.9	125	6		MOTTLED GRAY TO LIGHT BROWN SANDY CLAYEY GRAVEL (GC), medium dense, moist (original ground)
TxUU = 960 (1100)	24	14.8	119	8		MOTTLED LIGHT BROWN AND GRAY CLAYEY SAND (SC), dense, wet, with gravels
TxUU = 820 (1100)		13.2	124	10		
				12		
				14	▼	
	14					
Percent Passing No. 200 Sieve = 35.5	10			16	▽	GRAY SANDY GRAVEL (GP), loose to medium dense, wet
Percent Passing No. 200 Sieve = 1.5				18		
						ORANGE-BROWN SANDY CLAY (CL), hard, moist, with gravel (alluvium)
Percent Free Swell = 25		20.4	108			
LL = 31	42	18.9	106			
PL = 20		20.6	104	20		
PI = 11						
TxUU = 1510 (2100)						

*Converted to Standard Penetration Blow Counts

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LOG OF BORING 1

RUSSIAN RIVER TREATMENT PLANT
SONOMA COUNTY, CALIFORNIA

PLATE 4a

▽ groundwater first encountered at time of drilling

▼ groundwater at time of backfilling

LOG OF BORING 1

Equipment 6" FLIGHT AUGER

Elevation _____ Date 6-13-02

Laboratory Test Results or Remarks	Blows/foot *	Moisture Content (%)	Dry Density(pcf)	Depth (ft)	Sample	
Percent Free Swell = 30 UC(P) = 2700				22		
UC(P) = 4000	50+			24		ORANGE AND LIGHT BROWN SANDY CLAY (CL), hard, moist, with siltstone rock fragments (alluvium)
UC(P) = 4500		22.4	106			
				26		
				28		
UC(P) = 4500+	50+	18.5	113			
				30		
	50+			32		becomes brown to dark brown in color
				34		
				36		
				38		
	50+					

*Converted to Standard Penetration Blow Counts

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LOG OF BORING 1

RUSSIAN RIVER TREATMENT PLANT
SONOMA COUNTY, CALIFORNIA

PLATE

4b

▽ groundwater first encountered at time of drilling

▼ groundwater at time of backfilling

LOG OF BORING 2

Equipment 6" FLIGHT AUGER

Elevation _____ Date 6-13-02

Laboratory Test Results or Remarks	Blows/foot *	Moisture Content (%)	Dry Density(pcf)	Depth (ft)	Sample	
				0		GRAY CLAYEY SANDY GRAVEL (GC), dense, moist (fill)
						DARK BROWN SANDY CLAY (CL), very stiff, moist, with gravels (fill)
				2		
	20	10.7	124			
				4		MOTTLED DARK BROWN AND DARK GRAY SANDY CLAY (CL), very stiff, moist, with gravels (fill)
Percent Free Swell = 25	28					
		12.4	125			
				6		
Percent Free Swell = 35	18					
				8		
Percent Free Swell = 20	31					
		10.7	127			
				10		BROWN SANDY CLAY (CL), stiff, wet, with gravels (topsoil) and minor amount of organic debris
	11			12		
				14		GRAY SANDY GRAVEL (GP), loose, wet
	9					BROWN CLAYEY SAND (SC), medium dense, wet, with gravel
				16		
Percent Passing No. 200 Sieve = 37.8 LL = 26 PL = 18 PI = 8 UC(P) = 500	19					
Percent Passing No. 200 Sieve = 38.7 Percent Free Swell = 15				18		
				20		

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LOG OF BORING 2

RUSSIAN RIVER TREATMENT PLANT
SONOMA COUNTY, CALIFORNIA

PLATE **5a**

*Converted to Standard Penetration Blow Counts

▽ groundwater first encountered at time of drilling

▼ groundwater at time of backfilling

LOG OF BORING 2

Equipment 6" FLIGHT AUGER

Elevation _____ Date 6-13-02

Laboratory Test Results or Remarks	Blows/foot *	Moisture Content (%)	Dry Density(pcf)	Depth (ft)	Sample	
Percent Passing No. 200 Sieve = 38.1 TxUU = 736 (2100) TxUU = 410 (2200) Percent Free Swell = 20 Percent Passing No. 200 Sieve = 40.4	17	14.7 15.4	122 119	22		BROWN CLAYEY SAND (SC), medium dense, wet, with angular rock fragments
				24		
TxUU = 420 (3600) Percent Free Swell = 20 Percent Passing No. 200 Sieve = 47.4 UC(P) = 1200	18	23.4	104	26		
				28		ORANGE BROWN VERY SANDY CLAY (CL), stiff, moist, with gravel (alluvium)
UC(P) = 4500+	39	28.8	106	30		
				32		
				34		becomes hard, moist
UC(P) = 4500+	45	16.3	117	36		MOTTLED BROWN AND LIGHT BROWN SANDY CLAY (CL), hard, moist (alluvium)
				38		
	50+			40		

*Converted to Standard Penetration Blow Counts

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Job No: 3008.1.2

Date: 8-6-02

Appr: BP

LOG OF BORING 2

RUSSIAN RIVER TREATMENT PLANT
SONOMA COUNTY, CALIFORNIA

PLATE 5b

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS				TYPICAL NAMES
COARSE GRAINED SOILS — MORE THAN HALF IS LARGER THAN No. 200 SIEVE	GRAVEL — MORE THAN HALF OF COARSE FRACTION IS LARGER THAN No. 4 SIEVE SIZE	CLEAN GRAVEL WITH LESS THAN 5% FINES	GW	WELL GRADED GRAVEL, GRAVEL-SAND MIXTURE
			GP	POORLY GRADED GRAVEL, GRAVEL-SAND MIXTURE
		GRAVEL WITH OVER 12% FINES	GM	SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURE
			GC	CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURE
	SAND — MORE THAN HALF OF COARSE FRACTION IS SMALLER THAN No. 4 SIEVE SIZE	CLEAN SAND WITH LESS THAN 5% FINES	SW	WELL GRADED SAND, GRAVELLY SAND
			SP	POORLY GRADED SAND, GRAVELLY SAND
		SAND WITH OVER 12% FINES	SM	SILTY SAND, GRAVEL-SAND-SILT MIXTURE
			SC	CLAYEY SAND, GRAVEL-SAND-CLAY MIXTURE
FINE GRAINED SOILS — MORE THAN HALF IS SMALLER THAN No. 200 SIEVE	SILT AND CLAY — LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILT, ROCK FLOUR, SANDY OR CLAYEY SILT WITH LOW PLASTICITY
			CL	INORGANIC CLAY OF LOW TO MEDIUM PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAY (LEAN)
			OL	ORGANIC CLAY AND ORGANIC SILTY CLAY OF LOW PLASTICITY
	SILT AND CLAY — LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILT, MICACEOUS OR DIATOMACIOUS FINE SANDY OR SILTY SOIL, ELASTIC SILT
			CH	INORGANIC CLAY OF HIGH PLASTICITY, GRAVELLY, SANDY OR SILTY CLAY (FAT)
			OH	ORGANIC CLAY OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILT
HIGHLY ORGANIC SOILS			Pt	PEAT AND OTHER HIGHLY ORGANIC SOILS

KEY TO TEST DATA

				Shear Strength, psf	Confining Pressure, psf
EI	— Expansion Index	TxUU	— Unconsolidated Undrained Triaxial	320	(2600)
Consol	— Consolidation	TxCU	— Consolidated Undrained Triaxial	320	(2600)
LL	— Liquid Limit (in %)	DSCD	— Consolidated Drained Direct Shear	2750	(2000)
PL	— Plastic Limit (in %)	FVS	— Field Vane Shear	470	
PI	— Plasticity Index	LVS	— Laboratory Vane Shear	700	
SA	— Sieve Analysis	UC	— Unconfined Compression	2000	*
G_s	— Specific Gravity	UC(P)	— Laboratory Penetrometer	700	*
■	"Undisturbed" Sample				
□	Bulk Sample				

Notes: (1) All strength tests on 2.8" or 2.4" diameter samples unless otherwise indicated * Compressive Strength

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Date: 08-08-02
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SOIL CLASSIFICATION CHART AND KEY TO TEST DATA

RUSSIAN RIVER TREATMENT PLANT
SONOMA COUNTY, CALIFORNIA

PLATE 6

A. CONSOLIDATION OF SEDIMENTARY ROCKS; usually determined from unweathered samples. Largely dependent on cementation

1. U = unconsolidated
2. P = poorly consolidated
3. M = moderately consolidated
4. W = well consolidated

B. BEDDING OF SEDIMENTARY ROCKS

Splitting Property	Thickness	Stratification
1. Massive	Greater than 4.0 ft	very thick bedded
2. Blocky	2.0 to 4.0 ft	thick bedded
3. Slabby	0.2 to 2.0 ft	thin bedded
4. Flaggy	0.05 to 0.2 ft	very thin bedded
5. Shaly or platy	0.01 to 0.05 ft	laminated
6. Papery	less than 0.01 ft	thinly laminated

C. FRACTURING

Intensity	Size of Pieces in Feet
1. Very little fractured	Greater than 4.0 ft.
2. Occasionally fractured	1.0 to 4.0 ft
3. Moderately fractured	0.5 to 1.0 ft
4. Closely fractured	0.1 to 0.5 ft
5. Intensely fractured	0.05 to 0.1 ft
6. Crushed	less than 0.05 ft

D. HARDNESS

1. Soft – Reserved for plastic material alone.
2. Low hardness – can be gouged deeply or carved easily with a knife blade.
3. Moderately hard – can be readily scratched by a knife blade; scratch leaves a heavy trace of dust and is readily visible after the powder has been blown away.
4. Hard – can be scratched with difficulty; scratch produces little powder and is often faintly visible.
5. Very hard – cannot be scratched with knife blade; leaves a metallic streak.

E. STRENGTH

1. Plastic – of very low strength.
2. Friable – Crumbles easily by rubbing with fingers.
3. Weak – An unfractured specimen of such material will crumble under light hammer blows.
4. Moderately strong – Specimen will withstand a few heavy hammer blows before breaking.
5. Strong – Specimen will withstand a few heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments.
6. Very strong – Specimen will resist heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments.

F. WEATHERING – The physical and chemical disintegration and decomposition of rocks and minerals by natural processes such as oxidation, reduction, hydration, solution, carbonation, and freezing and thawing.

1. Deep – Moderate to complete mineral decomposition; extensive disintegration; deep and thorough discoloration; many fractures, all extensively coated or filled with oxides, carbonates and/or clay or silt.
2. Moderate – Slight change or partial decomposition of minerals; little disintegration; cementation little to unaffected. Moderate to occasional intense discoloration. Moderately coated fractures.
3. Little – No megascopic decomposition of minerals; little or no effect on normal cementation. Slight and intermittent, or localized discolorization. Few stains on fracture surfaces.
4. Fresh – Unaffected by weathering agents. No disintegration or discolorization.

PIT NUMBER	DEPTH	TEST TYPE*	TEST RESULTS
1	0.5	FS	60
	0.5	UC(P)	2000
	1.0	UC(P)	2500
	2.0	FS	80
	2.5	UC(P)	4500
	3.0	UC(P)	4000
	3.5	UC(P)	4500
	4.0	UC(P)	4500
	5.0	FS	40
2	1.0	-200	37.4
	1.0	FS	40
	6.0	FS	40
	6.0	UC(P)	2500
	8.0	UC(P)	4000
	8.5	UC(P)	3500
	9.5	UC(P)	3500
	10.0	UC(P)	4000
	10.5	UC(P)	3000
3	2.5	UC(P)	2000
	7.0	UC(P)	3500
	9.5	UC(P)	3500
	10.0	FS	70
	12.5	UC(P)	3000
	14.0	FS	50
4	3.0	FS	40

*Test Type

M	Moisture Content (percent of dry weight)
MD	Moisture Content (percent of dry weight)/dry density (pounds per cubic foot)
UC(P)	Penetrometer - strength indicator (pounds per square foot)
UC	Unconfined Compression (pounds per square foot)
-200	Percent Passing No. 200 sieve by weight
FS	Percent Free Swell

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Date: 08-08-02
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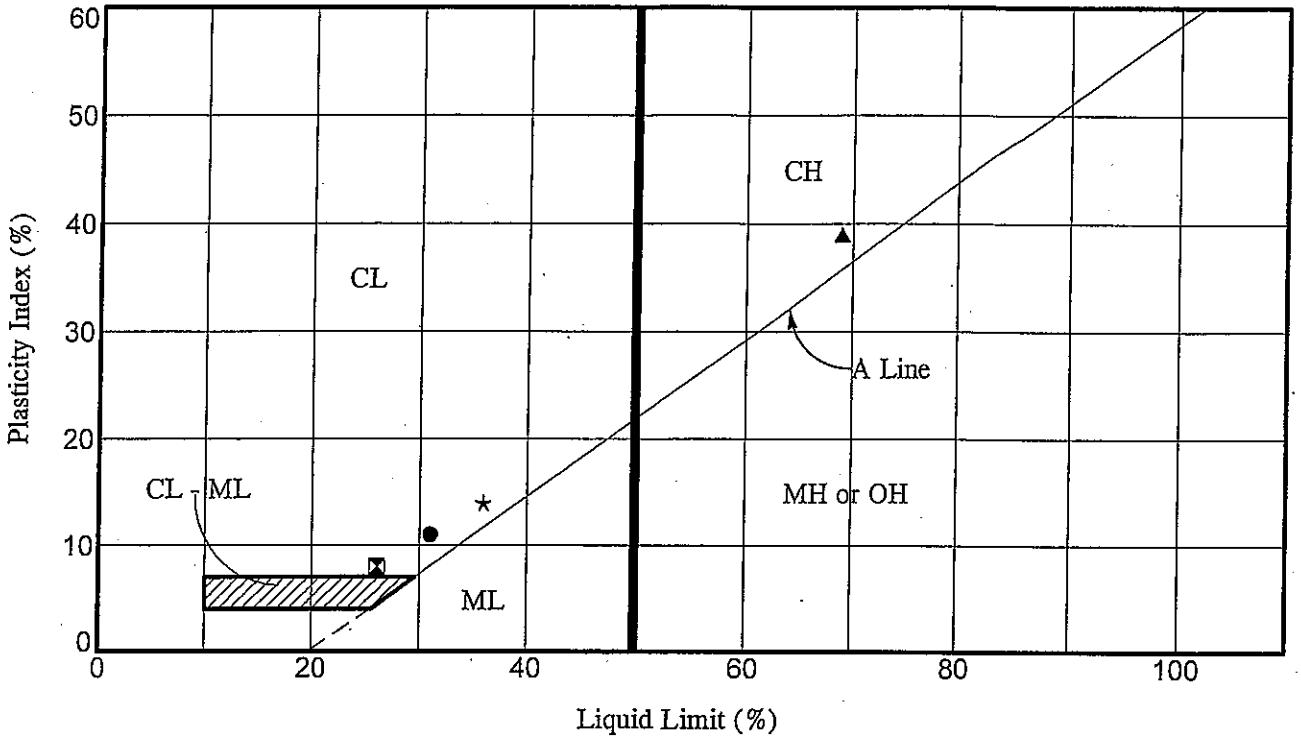
LABORATORY TEST DATA

RUSSIAN RIVER
TREATMENT PLANT
SONOMA COUNTY, CALIFORNIA

PLATE 8



ASTM D 4318-84

Symbol	Classification and Source	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Free Swell (%)
●	**MOTTLED ORANGE AND LIGHT BROWN SANDY CLAY (CL** **Test Boring 1 at 19.0 feet**	31	20	11	25
⊠	**BROWN GRAVELLY CLAYEY SAND (SC)** **Test Boring 2 at 16.2 feet**	26	18	8	--
▲	**DARK BROWN SANDY CLAY (CH)** **Test Pit 1 at 2.0 feet**	69	30	39	80
★	**DARK GRAY SANDY CLAY (CL)** **(weathered rock)** **Test Pit 1 at 5.0 feet**	36	22	14	40

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PLASTICITY INDEX RESULTS

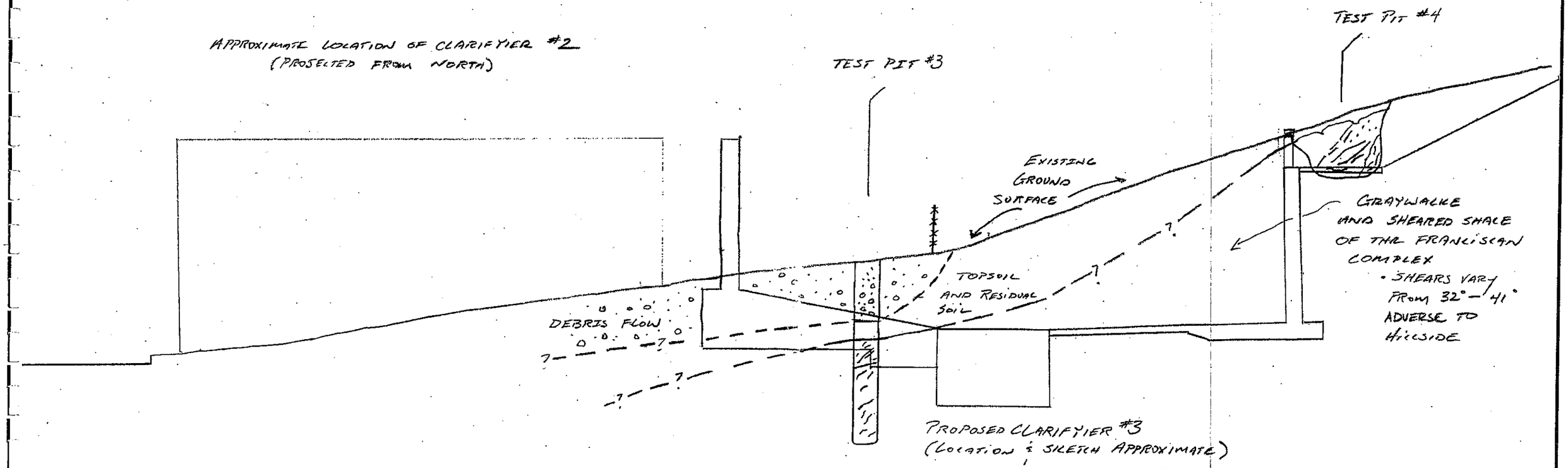
RUSSIAN RIVER TREATMENT PLANT
SONOMA COUNTY, CALIFORNIA

PLATE 9

APPROXIMATE LOCATION OF CLARIFYIER #2
(PROJECTED FROM NORTH)

TEST PIT #3

TEST PIT #4



SCALE: 1" = 10'

0 5' 10'

* CROSS-SECTION SHOWN ABOVE IS APPROXIMATE. ACTUAL POSITIONING OF CLARIFIER AND SUBSURFACE INFORMATION MAY DIFFER FROM THAT SHOWN.

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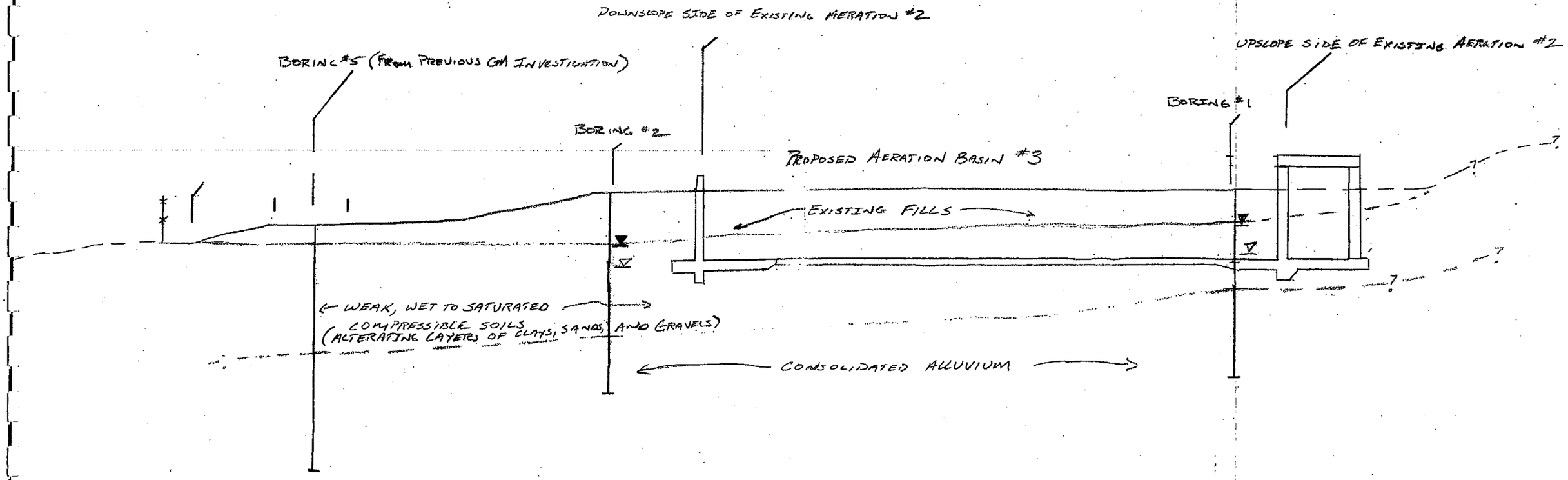
CROSS-SECTION THROUGH
CLARIFIER #3
RUSSIAN RIVER
TREATMENT PLANT
SONOMA COUNTY, CALIFORNIA

PLATE
10



SCALE: 1" = 20'
0 10' 20'

▽ ESTIMATED GROUNDWATER LEVEL (6/13/02)

▼

* CROSS-SECTION SHOWN ABOVE IS APPROXIMATE. ACTUAL POSITIONING OF AERATION BASIN AND SUBSURFACE INFORMATION MAY DIFFER FROM THAT SHOWN.

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Date: 07-10-02
Appr: RP

CROSS-SECTION THROUGH
AERATION BASIN #3
RUSSIAN RIVER
TREATMENT PLANT
SONOMA COUNTY, CALIFORNIA

PLATE
11

SUPPLEMENTAL REPORT, SOIL ENGINEERING CONSULTATION, RUSSIAN RIVER EQUALIZATION BASIN

GIBLIN ASSOCIATES, JANUARY 2007

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Supplemental Report
Soil Engineering Consultation
Russian River Equalization Basin
Sonoma County, California

Prepared for
Sonoma County Water Agency
P.O. Box 11628
Santa Rosa, CA 95406

By

GIBLIN ASSOCIATES
Consulting Geotechnical Engineers

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Job No. 205.7.3-2
January 15, 2007

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INTRODUCTION

This report presents the results of our soil engineering consultation for the proposed wastewater treatment equalization basin to be constructed at the existing Russian River County Sanitation District Treatment Plant in Guerneville, California. The site is located at the southern terminus of Neely Road immediately north of the Russian River as shown on Plate 1. We previously performed soil investigations for the Study Area B Equalization Pond and Aeration Facility and the results were summarized in our report dated April 29, 1997. We also performed a geotechnical investigation for the expansion project that consisted of a proposed new aeration basin and secondary clarifier. The results of that investigation were summarized in our report dated September 6, 2002. This report is intended to supplement the proposed Equalization Pond investigation performed in 1997.

Based on our review of the Feasibility Study for the Equalization Basin performed by HDR Engineering Inc. dated August 22, 2005, we understand that three different alternatives have been proposed for construction of the basin. We understand that Alternative III, the earthen basin, is the preferred alternative. The pond is proposed to be constructed adjacent to the existing aeration facility in a currently undeveloped area that slopes gently to the south.

Preliminary plans by HDR indicate the earthen basin will include cuts and fills, as shown on the attached site plan (Plate 2). Cuts to the bottom of the pond will vary up to about 10 feet below the existing ground surface. We understand the excavated materials would be used at the proposed north and south embankment fills, with planned fills varying up to about 6

and 29 feet, respectively. Interior embankment slopes are proposed to be inclined 1¼:1 and the pond lining will consist of a commercial synthetic liner. We understand that the embankment height and reservoir capacity will be adjusted such that the completed project would not be considered a "*State-sized dam.*"

BACKGROUND

In our previous investigation for the equalization basin we concluded that, from a geotechnical standpoint, the site was suitable for the proposed pond, but significant soil engineering factors affect the site that would need to be considered during design and construction. These factors included:

1. The presence of existing fills and weak, compressible, upper natural sandy, gravelly, clayey and/or silty soils.
2. High groundwater table
3. An area of possible slope instability uphill of the north end of the proposed pond location.
4. The possibility of liquefaction and lateral spread of the underlying loose, sandy soil deposits.

PURPOSE AND SCOPE

Our understanding of the current project is based on our recent discussions with Mr. Dale Roberts (SCWA) and Mr. Craig Olson of HDR, and a brief site observation. The purpose of this supplemental consultation was to further evaluate the depth and nature of the underlying soil and bedrock materials at the proposed equalization basin with particular focus

on consolidation settlements of embankment fills, the potential for liquefaction and lateral spread using updated methods, slope stability, and extent of previously encountered fill materials.

To accomplish the stated purpose, we:

1. Reviewed our previous report and selected, published, geologic, seismic and geotechnical literature. The literature reviewed is listed in the Reference section of this report.

2. Viewed and interpreted stereo-paired air photos of the site and vicinity. Photos viewed are listed in the Reference section.

3. Performed a geologic reconnaissance to map the site geology in the project area.

4. Explored subsurface conditions to the extent of three (3) test borings in areas of the proposed new basin and three (3) probes within an area near the central portion of the basin where deep organic material was previously observed in our 1997 investigation. Following drilling of the test borings, two borings were then converted to pieziometers for purposes of obtaining groundwater levels, by others.

5. Performed laboratory testing of selected samples of the subsurface materials to determine their physical properties.

6. Performed engineering analyses.

7. Developed conclusions and recommendations concerning:

   - The risk of debris flows upslope of the planned basin by reviewing available air photos and performing a site reconnaissance of the slope and drainage swales above the planned basin.

   - Potential for liquefaction and lateral spread, and recommended mitigation measures, if appropriate.

- Site preparation and grading for the pond embankments, including a revised estimate of anticipated settlements.
- Soil engineering drainage.
- Supplemental soil engineering services.

WORK PERFORMED

We reviewed selected, published geologic, geotechnical, seismic information and aerial photographs in our files. The literature and air photos reviewed are listed in the Reference section at the end of this report.

On January 16, 2006 our staff geologist was at the facility to perform a reconnaissance of the site, map the site geology, and establish locations of the test borings. Mapped geologic features and approximate locations of the borings are shown on the attached site map, Plate 2. In addition, one cross-section (A-A´) of the ground surface within the proposed basin site was developed using topographic information provided for our use.

On March 29, April 26, and May 10, 2006, we explored subsurface conditions to the extent of three (3) test borings and three (3) probes positioned within the proposed basin area. The borings were drilled to depths that varied from about 23½ to 51 feet with truck-mounted hollow-stem auger equipment. The probes were drilled to depths that varied from 15 to 21 feet. Relatively undisturbed samples were obtained from the borings with a 2½-inch (inside-diameter) split-spoon sampler and a 2-inch (outside-diameter) Standard Penetration Test (SPT) sampler. The samplers were driven with a 140-pound drop-hammer with a stroke of

approximately 30 inches. The blows required to drive the sampler were recorded and converted to equivalent Standard Penetration blow counts for correlation with empirical data. Logs of the test borings showing soil classifications, sample depths and converted blow counts are presented on Plates 3 through 8. The soils are classified in accordance with the Unified Soil Classification System explained on Plate 9.

Selected samples were tested in our laboratory to determine dry density and moisture content, classification (Atterberg Limits, percent free swell, sieve analysis and percent passing No. 200 sieve) and strength characteristics. Detailed results of the Atterberg Limits tests are presented on Plates 10 through 14.

The test boring and probe locations indicated on Plate 2 are approximate and were established by visually estimating from existing surface features. Test boring and probe elevations were estimated by interpolating between contour lines on a topographic map prepared by HDR. The boring and probe locations and elevations should be considered no more accurate than implied by the methods used to establish the data. At the completion of the exploration, Test Borings 1 and 2 were converted to pieziometers. The probes and Test Boring 3 were backfilled with the excavated soils and capped with a bentonite/cement slurry.

DISCUSSION AND CONCLUSIONS

Based on the results of our supplemental field exploration, laboratory tests, engineering analyses and review of our previous investigation report, we conclude that, in general, the conclusions and recommendations contained in our previous report would be applicable to the

proposed construction. However, significant geotechnical and geologic factors concerning the proposed equalization basin must be considered in design and construction. Recommendations presented herein are intended to supplement those provided in our previous report. The previous report should be referred to for recommendations not included in this supplemental consultation letter. Factors discussed in more detail in subsequent sections of this report include:

1. The presence of existing fills, organic debris, and deep weak compressible soils underlying natural alluvial soils of relatively moderate strength.

2. Strong seismic shaking resulting in liquefaction and/or the potential for lateral spread.

Debris Flows and/or Debris Pits

Based on our observations and air photo interpretations, debris flow paths are present upslope and possibly within a portion of the proposed basin area. The extent of a possible debris flow path within the basin area is depicted approximately on the attached Plate 2. Some uncertainty exists whether the organic laden debris observed in Test Boring 2, Probe 3 (2006) and Test Borings 2 and 3 drilled in 1997 is a result of a debris flow or a burial pit for organic debris. Review of air photos indicates a row of large redwoods trees that were present within the vicinity of these borings/probes. It could be speculated that these redwood trees were removed and subsequently buried during past farming and/or logging practices on the property. However, during our reconnaissance and through conversations with facility personnel that during periods of heavy rainfall in either 1995 or 1998, a

large debris flow occurred that affected the entrance roadway, upslope of the proposed basin. We also understand that during the recent heavy rains of 2006, a smaller debris flow washed down about 5 to 6 feet of material from the upslope hills. If the organic materials observed in the test borings are part of a large debris flow, the materials appear to vary up to about 20 feet thick.

Existing Fills and Deep Compressible Soils

The natural soils encountered below the fills in the central and southern portions of the proposed basin exhibit relatively low to moderate strength to a depth of about 30 feet below the ground surface. Our previous report indicated that the soils appear to be normally consolidated. That is, the materials have come to near equilibrium under their own weight. However, the consolidation tests also indicate that the soils would be subject to significant settlement under new loads or fills. Our settlement analyses to estimate the magnitude of total settlements resulting from the proposed new embankment loads indicates that total settlements resulting from a 29-foot-high fill embankment with exterior side slopes inclined at 2:1 and interior side slope inclined at about 1¼:1 would be about roughly the same as previously indicated in our investigation report. Settlements of such magnitude could result in distress to the pond and/or lining materials. Previous alternatives recommended in our investigation report to significantly reduce potential distress resulting from the anticipated settlements included:

a) Overexcavation of a portion of the compressible soils and replacement as compacted fill.

b) Surcharging of fill areas to promote settlement prior to installation of the pond lining.

c) The use of deep ground modification methods such as deep dynamic compaction, injection grouting, stone columns, or the installation of displacement piers.

A discussion of each of these alternatives is included in our original investigation report. During our recent meeting at your office, we discussed the use of an alternative ground modification technique referred to as the "Impact Intermediate Foundation System," developed by the Geopier Foundation Company. From our discussions with a representative of the Geopier Foundation Company, we understand the advantage of the "Impact System" is that it could be used as an effective replacement for large overexcavation and replacement and can be installed in soils that are subject to caving and in areas of high groundwater. Another advantage is that it can be used as a deep ground treatment for liquefaction. We could provide specific recommendations for this alternative technique, if desired.

Groundwater

In Borings 1, 2 and 3 positioned within the basin site, groundwater was initially observed during drilling at depths of about 20½, 15 and 7 feet below the adjacent ground surface, respectively. After drilling Boring 1, we returned to the site about one month later to drill Boring 2 and observed that the groundwater in Boring/Piezometer 1 was approximately 9 feet below the existing ground surface. Once Boring 2 was drilled and converted to a piezometer, we observed that about 5 hours later, the depth to groundwater was measured at

approximately 7 feet below the existing adjacent grade. In Probes 1, 2 and 3, depth to groundwater was measured at approximately 7 feet below the existing adjacent grade.

Liquefaction and Lateral Spread

Liquefaction, a loss in shear strength, and densification, a reduction in void ratio, are phenomena associated with loose, sandy soil deposits subjected to ground shaking during earthquakes. Surface cracking and significant subsidence can result from soil liquefaction or densification during strong earthquake shaking. Other phenomena associated with strong ground shaking at sites near slopes are lateral spreading and soil lurching. Lateral spreading is a horizontal slumping generally downslope, and lurching is a virtually instantaneous lateral displacement of a soil mass out of a slope.

We have analyzed the soil data from the borings at the site in accordance with the "*Simplified Procedure for Evaluating Soil Liquefaction Potential*" by H. B. Seed and I. M. Idriss, published in the Journal of the Soil Mechanics and Foundation Division of the American Society of Civil Engineers, dated September 1971, and "*Proceedings of the NCEER Workshop on Evaluation of Liquefaction Resistance of Soils,*" dated December 31, 1997. Also, because of the proximity of the proposed pond and fill embankment to the nearby open slope of the Russian River creek bank, we analyzed the soil data from the borings at the site in accordance with the "*Empirical Prediction of Liquefaction-Induced Lateral Spread*" by Bartlett and Youd, published in the Journal of Geotechnical Engineering, dated 1995.

Based on our analyses, we conclude that the loose, sandy soils interpreted to be overbank deposits encountered in Boring 3 (2006) and Borings 5 and 6 (1997) will be subject to liquefaction and/or densification and could result in settlement during strong ground shaking. The table below summarizes the borings, date drilled and the depths and/or layers where the potentially liquefiable soils occur. In addition based on our analyses, we judge that potential horizontal ground displacements on the order of about 1 foot or less could occur should the underlying materials experience liquefaction and lateral spreading during a seismic event. An interpretive geologic cross-section (A-A´) of the subsurface conditions is shown on the attached Plate 15. It should be understood that cross sections in nature are interpretive and that contacts should be considered gradational and approximate. Actual subsurface conditions may differ from that shown. Also, the approximate extent of potentially liquefiable soils extending beneath the proposed embankment is shown on the attached Plate 2 and is labeled as Qt (terrace deposits).

Summary of Liquefiable Soils

Boring	Date	Depths
3	2006	19 to 26 feet
5	1997	13 to 18 feet
6	1997	8 to 22 feet

Whether liquefaction, lateral spread and/or densification would actually occur depends on complicated factors, such as intensity and duration of ground shaking at the site and

underlying soil and groundwater conditions. The recommended use of deep ground modification techniques are intended to satisfactorily reduce the risk of such potential distress should these phenomena occur.

Ground Shaking

Numerous moderate and occasional large earthquakes have affected the San Francisco Bay Area during historic times, however large historic earthquakes in the North Bay area, including the project vicinity, have been relatively infrequent. The most notable large earthquake to affect the project vicinity was the California earthquake of 1906 with its epicenter located near the town of Olema in Marin County. Historic records indicate the 1906 earthquake produced strong ground shaking in the project vicinity and resulted in liquefaction and lateral spread in the Russian River alluvium. Near Duncan's Mills, the Russian River alluvium was affected by liquefaction and lateral spread during strong earthquake shaking during the 1906 earthquake. In that event, extensive ground cracking and sand boils occurred 200 to 250 feet back from the river (Youd, 1978).

Despite the historic infrequency of large magnitude earthquakes in the North Bay area, recent studies indicate the San Andreas, Rodgers Creek and Maacama faults are capable of generating large earthquakes in the future.

There is a high potential that very strong seismic ground shaking will affect the project site during the life of the project because of the site's proximity to major active faults in the region. The intensity of shaking at the site will depend on the distance to the earthquake

epicenter, depth and magnitude of the epicenter, and the response characteristics of the materials beneath the site. Provided the site is prepared in accordance with our recommendations to satisfactorily reduce the risk of liquefaction/densification and lateral spread, we judge the UBC Soil Profile Type "S_d" as described in the 1997 UBC, Table 16-J would be appropriate for use in project design.

The table below provides a summary of the closest recognized active faults to the project site, approximate distances and direction from the subject site to the respective fault and current Uniform Building Code (UBC) seismic source type designation.

Fault Name	Source Type	Approximate Distance To Site	General Direction (Site to Source)
Maacama (south)	B	27 kilometers	Northeast
Rodgers Creek	A	20.3 kilometers	Northeast
San Andreas (1906)	A	13.5 kilometers	Southwest

Probabilistic ground accelerations were estimated using the FRISKSP, Version 4 computer program. Using selected input parameters judged appropriate for the site conditions, the program estimated peak ground accelerations (PGA) of 0.47g and 0.55g for an exceedance probability of 10 percent in 50 years and 100 years, respectively.

Site Grading

In general, site grading should be performed as recommended in our investigation report. However, specific site grading recommendations would depend on the ground modification system used. We could provide specific grading recommendations, if requested.

Prior to placement of the synthetic pond liner, the finish interior surface of the pond should be prepared in accordance with the manufacturer's criteria.

Supplemental Services

We should provide additional consultation as design of the equalization pond progresses to further evaluate deep ground modification options and/or improvements and soil engineering design recommendations concerning geogrid reinforced fill slopes at the interior pond embankments. We should review final grading plans for conformance with the intent of our recommendations. During site preparation and grading, the soil engineer should observe the conditions encountered in the pond slope and bottom areas and key trench to verify that the materials encountered are as anticipated and to modify our recommendations, if warranted. Field and laboratory tests should be performed to ascertain that the specified moisture contents and degrees of compaction are being attained.

LIMITATIONS

We have performed the investigation and prepared this report in accordance with generally accepted standards of the soil engineering profession. No warranty, either express or

implied, is given. This scope of work is limited to evaluating the physical properties of earth materials considered typical of geotechnical engineering practice and does not include other concerns such as soil chemistry, corrosivity, mold, and soil and/or groundwater contamination.

Subsurface conditions are complex and may differ from those indicated by surface features or encountered at test boring locations. Therefore, variations in subsurface conditions not indicated on the logs could be encountered.

If the project is revised or if conditions different from those described in this report are encountered during construction, we should be notified immediately so that we can take timely action to modify our recommendations, if warranted.

Supplemental services as recommended herein are performed on an as-requested basis. We can accept no responsibility for items we are not notified to check, nor for use or interpretation by others of the information contained herein. Such services are in addition to this soil investigation, and are charged for on an hourly basis in accordance with our Standard Schedule of Charges.

Site conditions and standards of practice change. Therefore, we should be notified to update this report if construction is not performed within 24 months.

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Plate 2	Interpretative Geologic Map of the Pond Area and Test Borings Location Plan
Plates 3 through 8	Logs of Test Borings 1 through 3 and Probes 1 through 3
Plate 9	Soil Classification Chart and Key to Test Data
Plates 10 through 14	Plasticity Index Test Results
Plate 15	Interpretive Geologic Cross-Section A-A'

DISTRIBUTION

Copies Submitted: 4

Sonoma County Water Agency
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Santa Rosa, CA 95401
Attention: Mr. Dale Roberts

1

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Folsom, CA 95630
Attention: Craig Olson

BFP/JAG.sc/NN/HD/bound/bfp/Job No. 205.7.3-2

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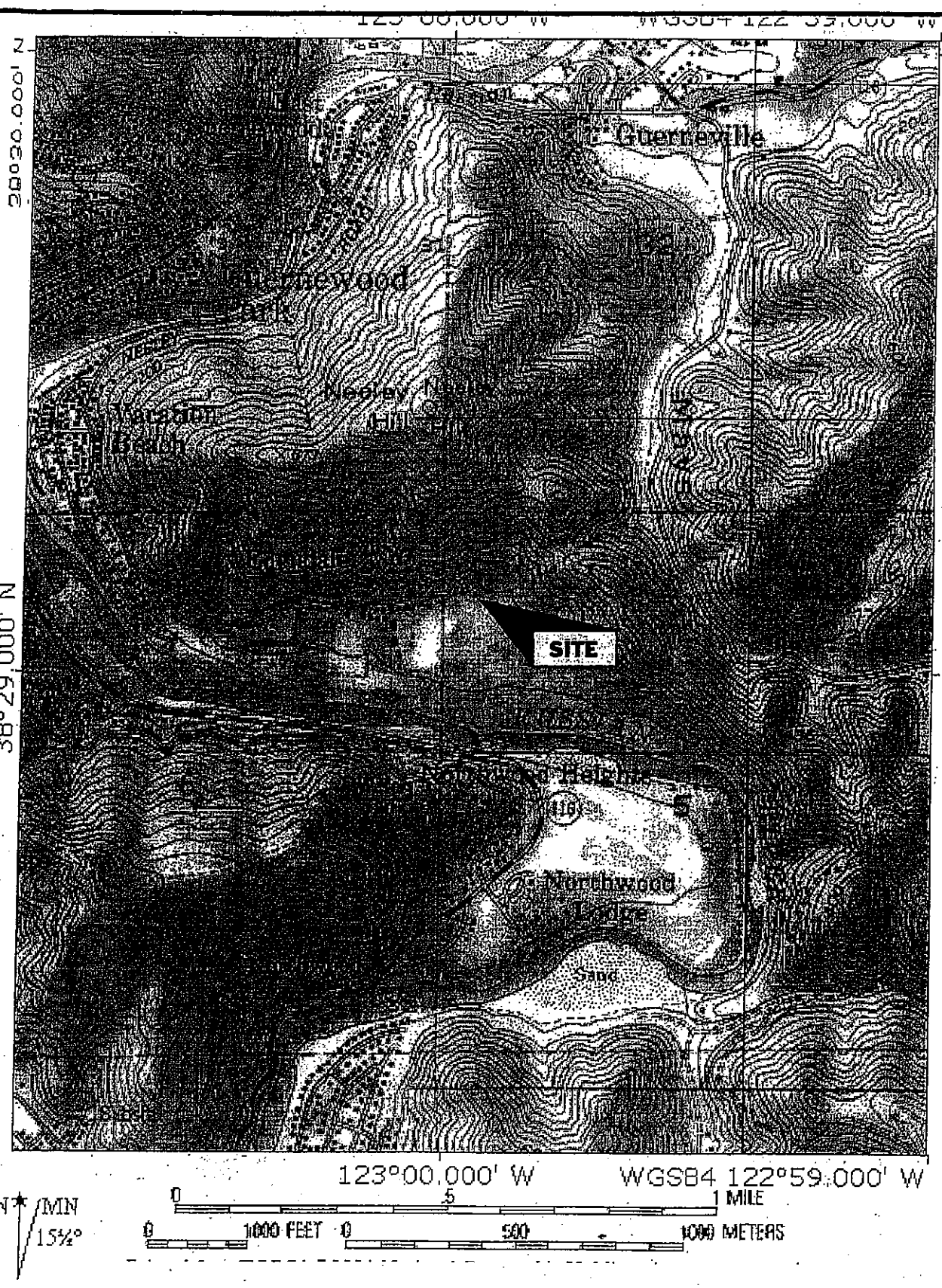
Air Photos

5-4-61, Nos. CSH-3BB-203 and 204, black and white

5-18-71, Nos. 3088-427 and 428, black and white

5-1-80, Nos. BW-SON-12-23 and 24, black and white

5-18-00, Nos. 50-013734-24-6 and 7, black and white



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CONSULTING GEOTECHNICAL ENGINEERS

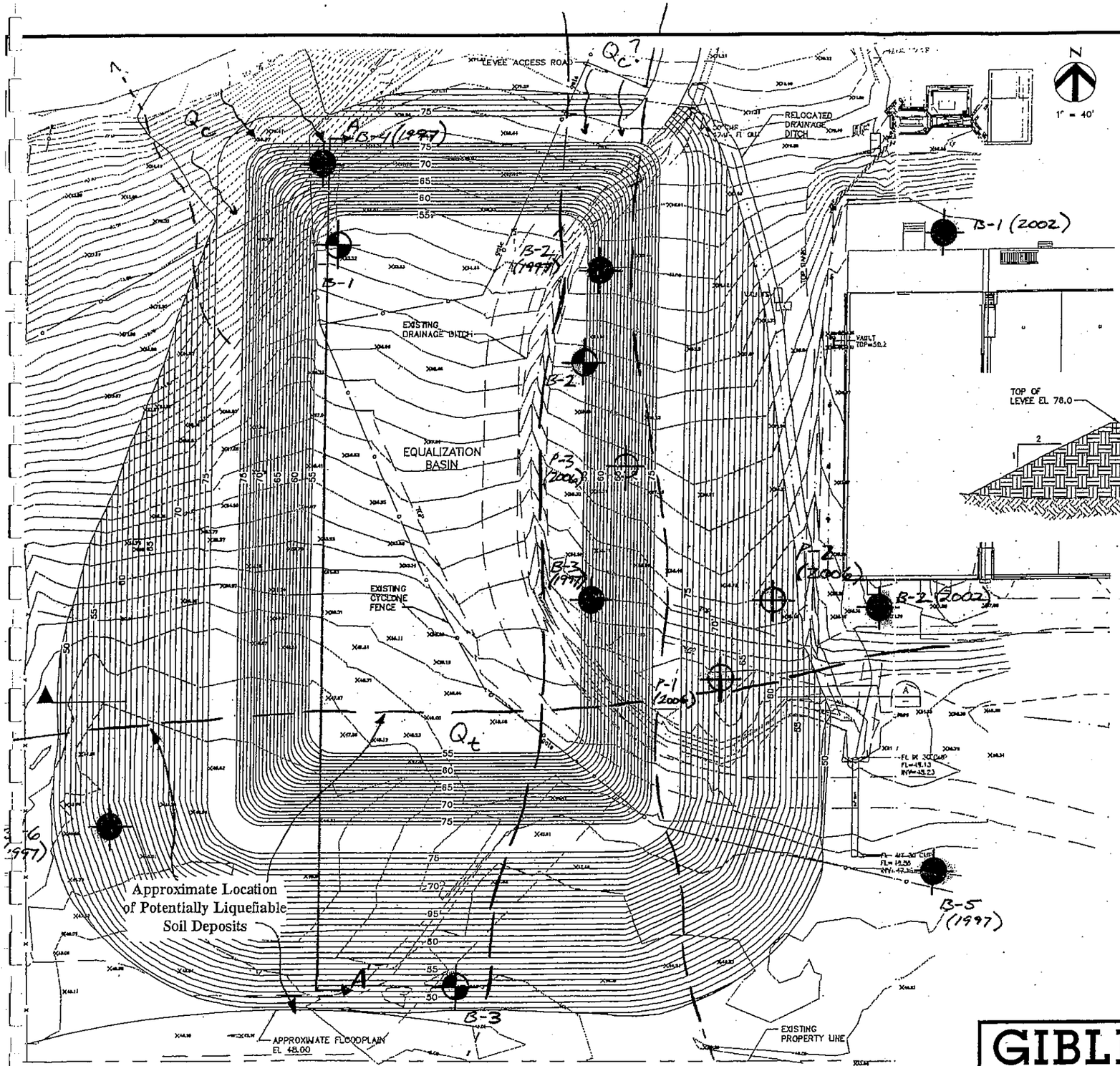
Job No: 2057.3-2

Date: 08-01-06

Appr: BP

PROJECT LOCATION MAP
RUSSIAN RIVER
EQUALIZATION BASIN
SONOMA COUNTY, CALIFORNIA

PLATE
1



KEY

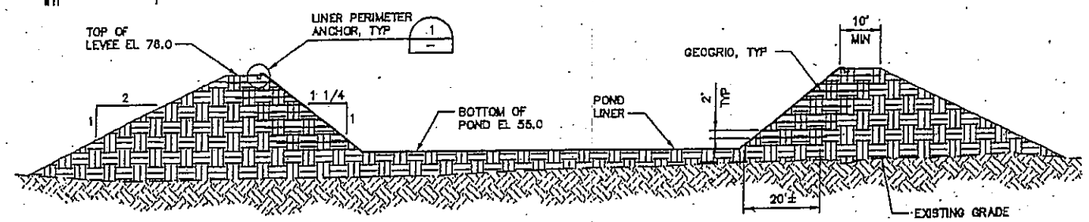
Symbols

- Approximate Test Boring Location
- Approximate Test Boring Location (Giblin Associates 1997 and 2002)
- Approximate Cross-Section Location
- Geologic Contact, dashed where approximate
- Possible Debris Flow Path and/or Debris Pit, approximate

Geologic Units

Qt: Alluvial Terrace Deposits

Qc: Colluvium, mapped where estimated to be greater than about 5 feet thick



SECTION
1" = 40'

SPECS:	
POND LENGTH:	250 FT
POND WIDTH:	150 FT
TOP OF LEVEE:	76.0
BOTTOM OF POND:	55.0
INTERIOR SIDE SLOPE:	1 1/4:1
EXTERIOR SIDE SLOPE:	2:1
LINER SURFACE AREA:	
INTERIOR SLOPE:	21,374 SQ FT
BOTTOM OF POND	19,170 SQ FT

CUT AND FILL (IN CUBIC YARDS)	
CUT:	2,911
FILL:	26,616
NET CUT/FILL:	23,705 FILL
POND VOLUME:	
WATER SURFACE EL:	73.0 (3'-0" FREEBOARD)
GALLONS:	3,552,000
ACRE FEET:	10.9
CUBIC YARDS:	17,556

RUSSIAN RIVER WWTP
EQUALIZATION BASIN – ALTERNATIVE III
EARTHEN BASIN

GIBLIN ASSOCIATES
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Job No: 205.7.3-2
Date: 08-01-06
Appr: BP

INTERPRETATIVE GEOLOGIC MAP OF THE POND AREA AND TEST BORING LOCATION PLAN
RUSSIAN RIVER EQUALIZATION BASIN
SONOMA COUNTY, CALIFORNIA

PLATE 2

▽ groundwater first encountered at time of drilling

▼ groundwater at time of backfilling

LOG OF BORING 1

Equipment 6" FLIGHT AUGER

Elevation 64.0 Date 3-29-06

Laboratory Test Results or Remarks	Blows/foot *	Moisture Content (%)	Dry Density(pcf)	Depth (ft)	Sample	
				0		DARK BROWN AND BROWN SANDY SILT (ML), stiff, wet, with occasional angular sandstone rock fragments, slightly porous
	10					
		21.2	98	2		
						becomes soft and saturated
	5	19.3	108	4		
	15					
LL = 22 PL = 18 PI = 4		19.8	110	6		LIGHT BROWN AND ORANGE SANDY CLAY (CL), stiff, wet, with angular shale rock fragments
				8	▼	
	43			10		
TxCU = 1990 (1000)	33	21.8	101			
TxCU = 5280 (2000)		21.2	99	12		BROWN AND DARK BROWN SANDY CLAY (CL), very stiff, moist, with angular shale rock fragments
				14		MOTTLED DARK BROWN AND DARK GRAY SHALE OF THE FRANCISCAN COMPLEX, intensely fractured, crushed, deeply weathered
	50+					
UC(P) = 4500+		14.6	117	16		
				18		
	50+			20	▽	
				22		
	50+					same intensely fractured, low hardness, friable

*Converted to Standard Penetration Blow Counts

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Job No: 205.7.3-2

Date: 8-1-06

Appr: BP

LOG OF BORING 1

RUSSIAN RIVER EQUALIZATION BASIN
SONOMA COUNTY, CALIFORNIA

PLATE 3

▽ groundwater first encountered at time of drilling

▼ groundwater at time of backfilling

LOG OF BORING 2

Equipment 6" FLIGHT AUGER

Elevation 61.5 Date 4-26-06

Laboratory Test Results or Remarks	Blows/foot *	Moisture Content (%)	Dry Density(pcf)	Depth (ft)	Sample	
Percent Free Swell = 30	36	12.4	115	0		MOTTLED BROWN AND DARK BROWN SANDY SILT (ML), very stiff, moist, with occasional subrounded gravels (fill)
	16	15.0	111	2		MOTTLED RED AND BROWN SILTY SAND (SM), stiff, moist, with subrounded gravels (fill)
				4		BLUE GRAY SANDY SILT (OL), very stiff, wet, with pieces of wood (fill or debris flow deposits)
	29	31.1	81	6		FILL
Percent Passing No. 200 Sieve = 28.8 Percent Passing No. 200 Sieve = 27.2	38	13.1 12.1	119 122	8		MOTTLED BROWN - GRAY CLAYEY SAND (SC), medium dense, wet, with subangular to subrounded sandstone rock fragments
LL = 25 PL = 18 PI = 7	20			10		
				12		becomes saturated
LL = 27 PL = 19 PI = 8	32			14	▽	
				16		
	33			18		MOTTLED GRAY AND BROWN VERY SILTY SAND (SM), medium dense, wet, with angular sandstone rock fragments
LL = 23 PL = 18 PI = 5 Gravel = 32% Sand = 44% Silt = 24%	45			20		
				22		BROWN CLAYEY SAND (SC), medium dense, saturated
				24		

*Converted to Standard Penetration Blow Counts

GIBLIN ASSOCIATES
CONSULTING GEOTECHNICAL ENGINEERS

Job No: 205.7.3-2

Date: 8-1-06

Appr: CP

LOG OF BORING 2

RUSSIAN RIVER EQUALIZATION BASIN
SONOMA COUNTY, CALIFORNIA

PLATE 4a

▽ groundwater first encountered at time of drilling

▼ groundwater at time of backfilling

LOG OF BORING 2

Equipment 6" FLIGHT AUGER

Elevation 61.5 Date 4-26-06

Laboratory Test Results or Remarks	Blows/foot *	Moisture Content (%)	Dry Density(pcf)	Depth (ft)	Sample	
LL = 26 PL = 18 PI = 8	22			24		LIGHT BROWN CLAY (CL), medium stiff, wet
				26		MOTTLED GRAY AND BROWN CLAYEY SAND (SC), medium dense, saturated
Gravel = 27% Sand = 48% Clay = 25% LL = 28 PL = 18 PI = 10	30			28		BROWN SANDY CLAY (CL), stiff, saturated, with angular sandstone rock fragments
	18	12.5 15.0	122 119	30		
				32		
				34		LIGHT BROWN SANDY CLAY (CL), hard, wet, with subrounded gravel rock fragments
				36		
	42			38		

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CONSULTING GEOTECHNICAL ENGINEERS

Job No: 205.7.3-2

Date: 8-1-06

Appr: BP

LOG OF BORING 2

RUSSIAN RIVER EQUALIZATION BASIN
SONOMA COUNTY, CALIFORNIA

PLATE 4b

* Converted to Standard Penetration Blow Counts

▽ groundwater first encountered at time of drilling

▼ groundwater at time of backfilling

LOG OF BORING 3

Equipment 6" FLIGHT AUGER

Elevation 48.2 Date 5-10-06

Laboratory Test Results or Remarks	Blows/foot *	Moisture Content (%)	Dry Density(pcf)	Depth (ft)	Sample	
				0		BROWN FINE SAND WITH MINOR SILT (SM), loose, moist to wet
	9			2		
	12	28.1	106	4		becomes medium dense, wet
Percent Passing No. 200 Sieve = 12.4 Percent Passing No. 200 Sieve = 47.4	10			6		BROWN FINE SAND WITH SILT (SM), loose to medium dense, saturated
Gravel = 1% Sand = 37% Clay = 62% LL = 28 PL = 19 PI = 9	10			8		BROWN VERY SANDY CLAY (CL), medium stiff, saturated
UC(P) = 1300	20	24.8	101	10		LIGHT BROWN SANDY CLAY (CL), stiff, saturated, slightly plastic, with oxidation staining and occasional fine roots
	15			14		BROWN, GRAY, ORANGE BROWN, AND YELLOW BROWN SANDY CLAY (CL), with occasional coarse sand and fine subangular gravel
Gravel = 0% Sand = 85% Fines = 15%	13	27.7	97	18		LIGHT BROWN FINE SAND (SP) with minor silt, loose, saturated
Gravel = 0% Sand = 62% Fines = 38% LL = 24 PL = 18 PI = 6	12			20		BLUE GRAY FINE SAND WITH SILT (SM), loose, saturated
				22		
				24		

*Converted to Standard Penetration Blow Counts

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CONSULTING GEOTECHNICAL ENGINEERS

Job No: 205.7.3-2

Date: 8-1-06

Appr: BF

LOG OF BORING 3

RUSSIAN RIVER EQUALIZATION BASIN
SONOMA COUNTY, CALIFORNIA

PLATE 5a

▽ groundwater first encountered at time of drilling

▼ groundwater at time of backfilling

LOG OF BORING 3

Equipment 6" FLIGHT AUGER

Elevation 48.2 Date 5-10-06

Laboratory Test Results or Remarks	Blows/foot *	Moisture Content (%)	Dry Density(pcf)	Depth (ft)	Sample	
LL = 27 PL = 18 PI = 9 Gravel = 0% Sand = 48% Clay = 52%	10			24 26		GRAY SANDY CLAY (CL), stiff, saturated, with orange oxidation staining
	15			28 30		BROWN AND GRAY SANDY CLAY (CL), stiff to very stiff, with gravel
Percent Passing No. 200 Sieve = 58.6				32 34		
UC(P) = 3000	18	16.4	119	36 38		
	26	15.9	118	40 42		BROWN SANDY CLAY WITH GRAVEL (CL), very stiff, saturated
	28	16.3 21.8	117 107	44 46		GRAY BROWN SANDY CLAY (CL), very stiff, saturated
				48		

* Converted to Standard Penetration Blow Counts

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Job No: 205.7.3-2

Date: 8-1-06

Appr: BP

LOG OF BORING 3

RUSSIAN RIVER EQUALIZATION BASIN
SONOMA COUNTY, CALIFORNIA

PLATE 5b

▽ groundwater first encountered at time of drilling

▼ groundwater at time of backfilling

LOG OF BORING 3

Equipment 6" FLIGHT AUGER

Elevation 48.2 Date 5-10-06

Laboratory Test Results or Remarks	Blows/foot *	Moisture Content (%)	Dry Density(pcf)	Depth (ft)	Sample	
				48		ORANGE BROWN GRAY CLAYEY SAND (SC), very dense, saturated
Percent Passing No. 200 Sieve = 34.3 UC(P) = 1700 Percent Passing No. 200 Sieve = 30.4	25	26.0	100	50		

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Job No: 205.7.3-2

Date: 8-1-06

Appr: CP

LOG OF BORING 3

RUSSIAN RIVER EQUALIZATION BASIN
SONOMA COUNTY, CALIFORNIA

PLATE 5c

*Converted to Standard Penetration Blow Counts

▽ groundwater first encountered at time of drilling

▼ groundwater at time of backfilling

Laboratory Test Results or Remarks

Blows/foot *

Moisture Content (%)

Dry Density(pcf)

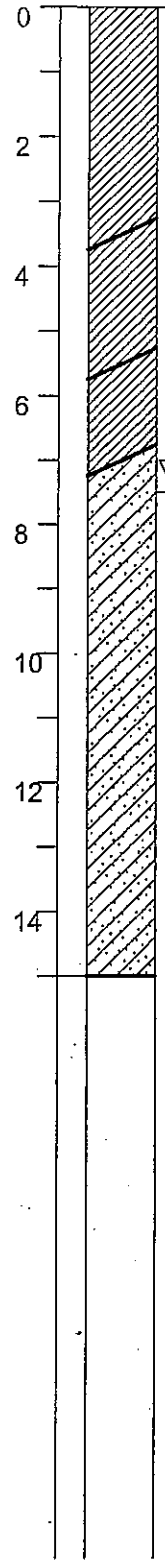
Depth (ft)

Sample

LOG OF PROBE 1

Equipment 6" FLIGHT AUGER

Elevation +/- 50 Date 4-26-06



BROWN SANDY CLAY (CL), soft, wet, with pieces of asphalt and gravel (fill)

FILL

DARK BROWN SANDY CLAY (CL), soft, wet, porous

RED BROWN SANDY CLAY (CL), soft, wet, with rootlets

▽ GRAY CLAYEY SAND (SC), loose to medium dense, saturated

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Job No: 205.7.3-2

Date: 8-1-06

Appr: BP

LOG OF PROBE 1

RUSSIAN RIVER EQUALIZATION BASIN
SONOMA COUNTY, CALIFORNIA

PLATE 6

Converted to Standard Penetration Blow Counts

▽ groundwater first encountered at time of drilling

▼ groundwater at time of backfilling

Laboratory Test Results or Remarks

Blows/foot *

Moisture Content (%)

Dry Density(pcf)

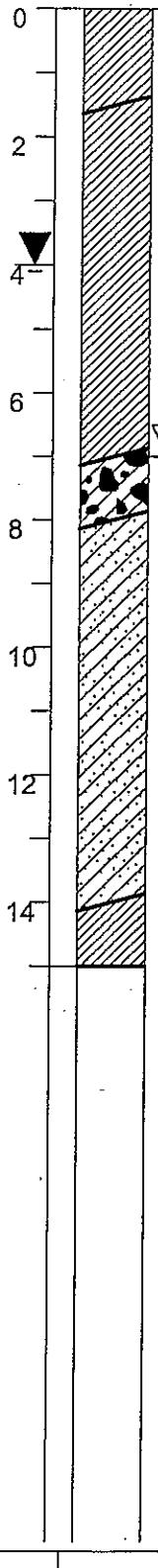
Depth (ft)

Sample

LOG OF PROBE 2

Equipment 6" FLIGHT AUGER

Elevation +/- 65 Date 4-26-06



DARK BROWN SANDY CLAY (CL), soft, wet (fill)

FILL

RED BROWN SANDY CLAY (CL), with rock fragments, medium stiff, wet

becomes very wet

GRAY SANDY GRAVEL (GC), loose to medium dense, saturated

GRAY CLAYEY SAND (SC), loose to medium dense, saturated

BROWN VERY SANDY CLAY (CL), stiff, wet

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Job No: 205.7.3-2

Date: 8-1-06

Appr: BL

LOG OF PROBE 2

RUSSIAN RIVER EQUALIZATION BASIN
SONOMA COUNTY, CALIFORNIA

PLATE 7

* Converted to Standard Penetration Blow Counts

▽ groundwater first encountered at time of drilling

▼ groundwater at time of backfilling

Laboratory Test Results or Remarks

Blows/foot *

Moisture Content (%)

Dry Density(pcf)

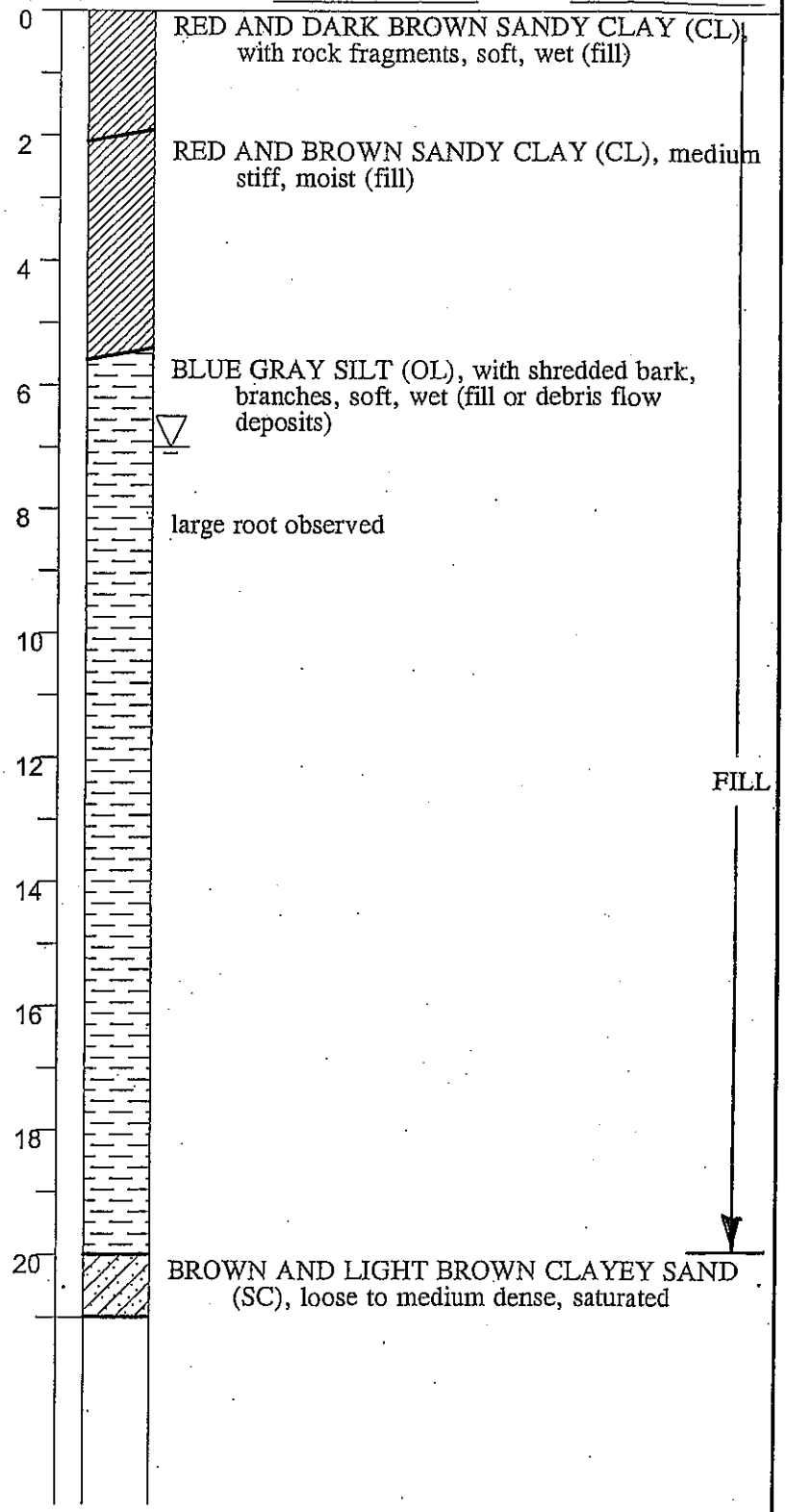
Depth (ft)

Sample

LOG OF PROBE 3

Equipment 6" FLIGHT AUGER

Elevation +/- 57 Date 4-26-06



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Job No: 205.7.3-2

Date: 8-1-06

Appr: DP

LOG OF PROBE 3

RUSSIAN RIVER EQUALIZATION BASIN
SONOMA COUNTY, CALIFORNIA

PLATE

8

* Converted to Standard Penetration Blow Counts

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS				TYPICAL NAMES
COARSE GRAINED SOILS — MORE THAN HALF IS LARGER THAN No. 200 SIEVE	GRAVEL — MORE THAN HALF OF COARSE FRACTION IS LARGER THAN No. 4 SIEVE SIZE	CLEAN GRAVEL WITH LESS THAN 5% FINES	GW	WELL GRADED GRAVEL, GRAVEL-SAND MIXTURE
			GP	POORLY GRADED GRAVEL, GRAVEL-SAND MIXTURE
		GRAVEL WITH OVER 12% FINES	GM	SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURE
			GC	CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURE
	SAND — MDRE THAN HALF DF COARSE FRACTIDN IS SMALLER THAN No. 4 SIEVE SIZE	CLEAN SAND WITH LESS THAN 5% FINES	SW	WELL GRADED SAND, GRAVELLY SAND
			SP	POORLY GRADED SAND, GRAVELLY SAND
		SAND WITH OVER 12% FINES	SM	SILTY SAND, GRAVEL-SAND-SILT MIXTURE
			SC	CLAYEY SAND, GRAVEL-SAND-CLAY MIXTURE
FINE GRAINED SOILS — MORE THAN HALF IS SMALLER THAN No. 200 SIEVE	SILT AND CLAY — LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILT, ROCK FLOUR, SANDY OR CLAYEY SILT WITH LOW PLASTICITY
			CL	INORGANIC CLAY OF LOW TO MEDIUM PLASTICITY, GRAVELLY, SANDY, OR SILTY CLAY (LEAN)
			OL	ORGANIC CLAY AND ORGANIC SILTY CLAY OF LOW PLASTICITY
	SILT AND CLAY — LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILT, MICACEOUS OR DIATOMACIOUS FINE SANDY OR SILTY SOIL, ELASTIC SILT
			CH	INORGANIC CLAY OF HIGH PLASTICITY, GRAVELLY, SANDY OR SILTY CLAY -(FAT)
			OH	ORGANIC CLAY OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILT
HIGHLY ORGANIC SOILS			Pt	PEAT AND DTHER HIGHLY ORGANIC SOILS

KEY TO TEST DATA

				Shear Strength, psf	Confining Pressure, psf
EI	— Expansion Index	TxUU	— Unconsolidated Undrained Triaxial	320	(2600)
Consol.	— Consolidation	TxCU	— Consolidated Undrained Triaxial	320	(2600)
LL	— Liquid Limit (In %)	DSCD	— Consolidated Drained Direct Shear	2750	(2000)
PL	— Plastic Limit (in %)	FVS	— Field Vane Shear	470	
PI	— Plasticity Index	LVS	— Laboratory Vane Shear	700	
SA	— Sieve Analysis	UC	— Unconfined Compression	2000	*
G_s	— Specific Gravity	UC(P)	— Laboratory Penetrometer	700	*
■	"Undisturbed" Sample				
□	Bulk Sample				

Notes: (1) All strength tests on 2.8" or 2.4" diameter samples unless otherwise indicated * Compressive Strength

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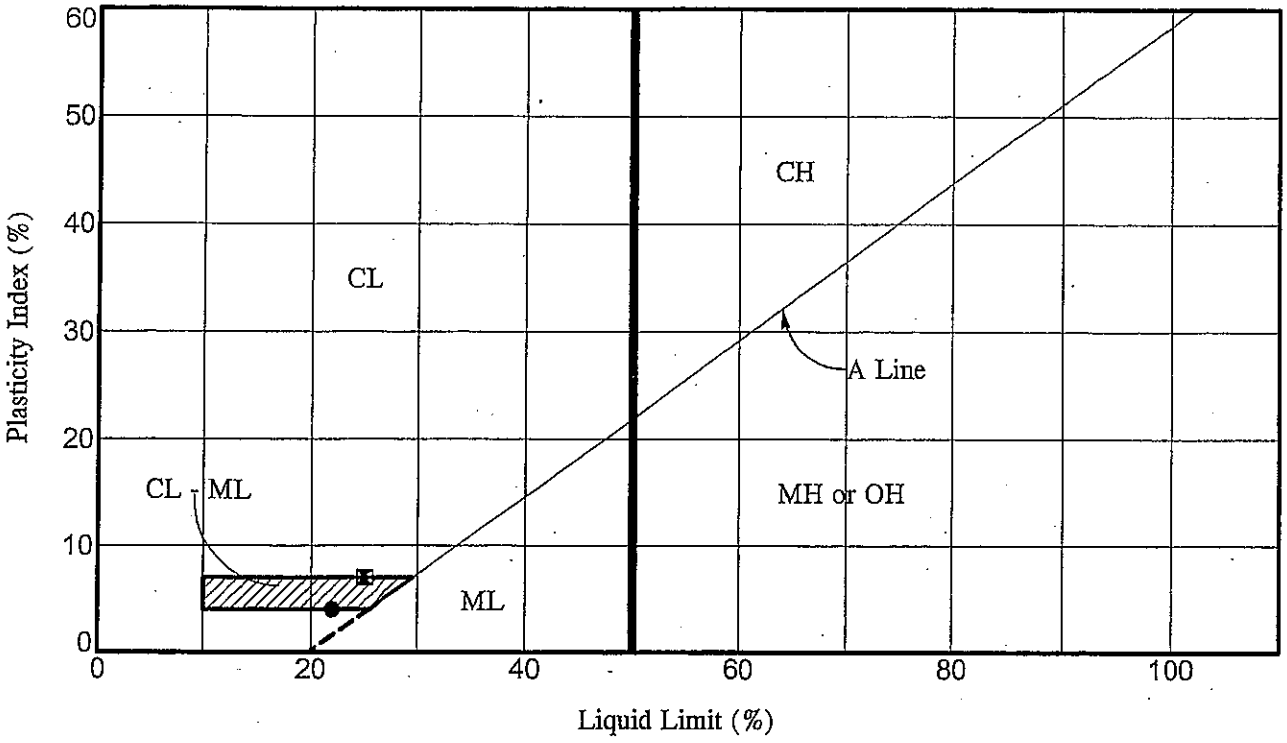
Job No: 205.7.3-2
Date: 01-11-07
Appr: BP

SOIL CLASSIFICATION CHART AND KEY TO TEST DATA
RUSSIAN RIVER EQUALIZATION BASIN
SONOMA COUNTY, CALIFORNIA

PLATE 9



ASTM D 4318-84

Symbol	Classification and Source	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Free Swell (%)
●	**DARK BROWN SANDY SILT (ML)** **Test Boring 1 at 5.9 feet**	22	18	4	--
⊠	**MOTTLED BROWN GRAVELLY CLAYEY FINE SAND (SC)** **Test Boring 2 at 10.5 feet and 11.0 feet and 11.5 feet**	25	18	7	--

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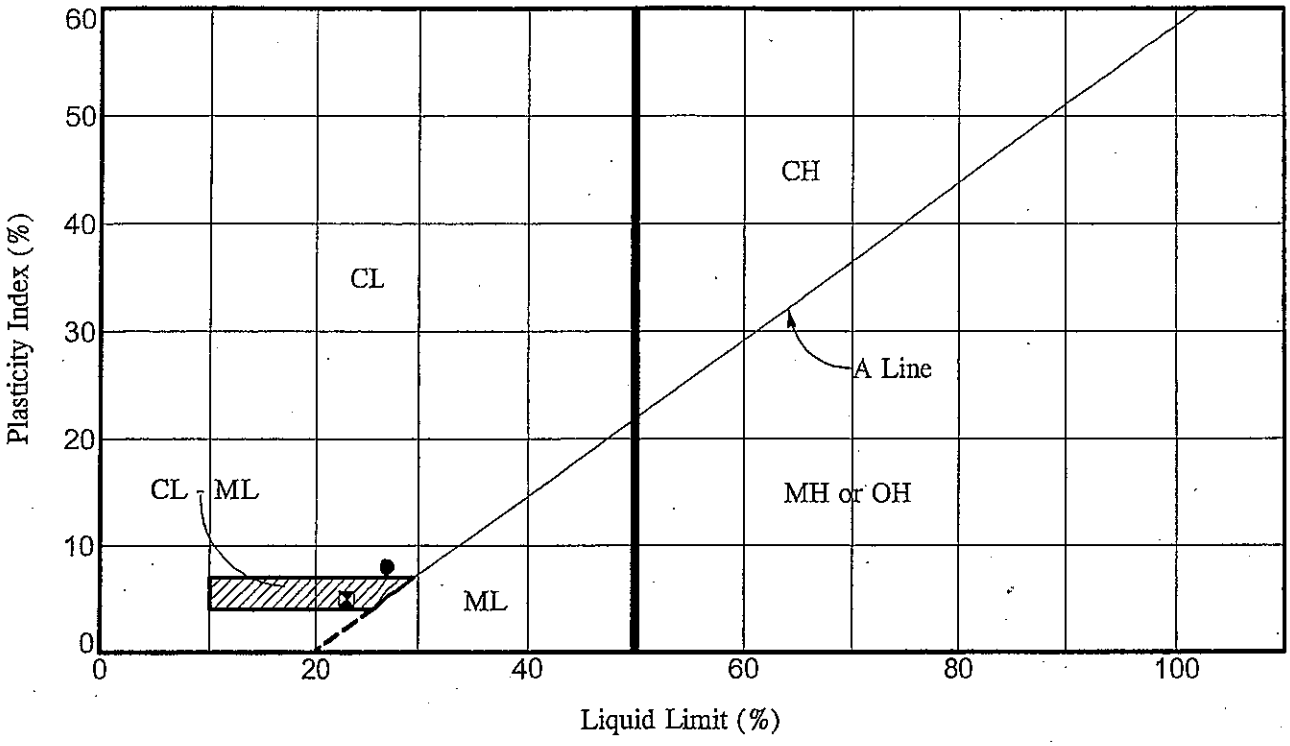
Job No: 205.7.3-2
Date: 8-1-06
Appr: DP

PLASTICITY INDEX RESULTS
RUSSIAN RIVER EQUALIZATION BASIN
SONOMA COUNTY, CALIFORNIA

PLATE
10



ASTM D 4318-84

Symbol	Classification and Source	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Free Swell (%)
●	**MOTTLED GRAY BROWN GRAVELLY CLAYEY SAND (SC)** **Test Boring 2 at 14.0 feet and 18.0 feet**	27	19	8	--
⊠	**BROWN GRAVELLY SILTY SAND (SM)** **Test Boring 2 at 20.0 feet and 20.4 feet**	23	18	5	--

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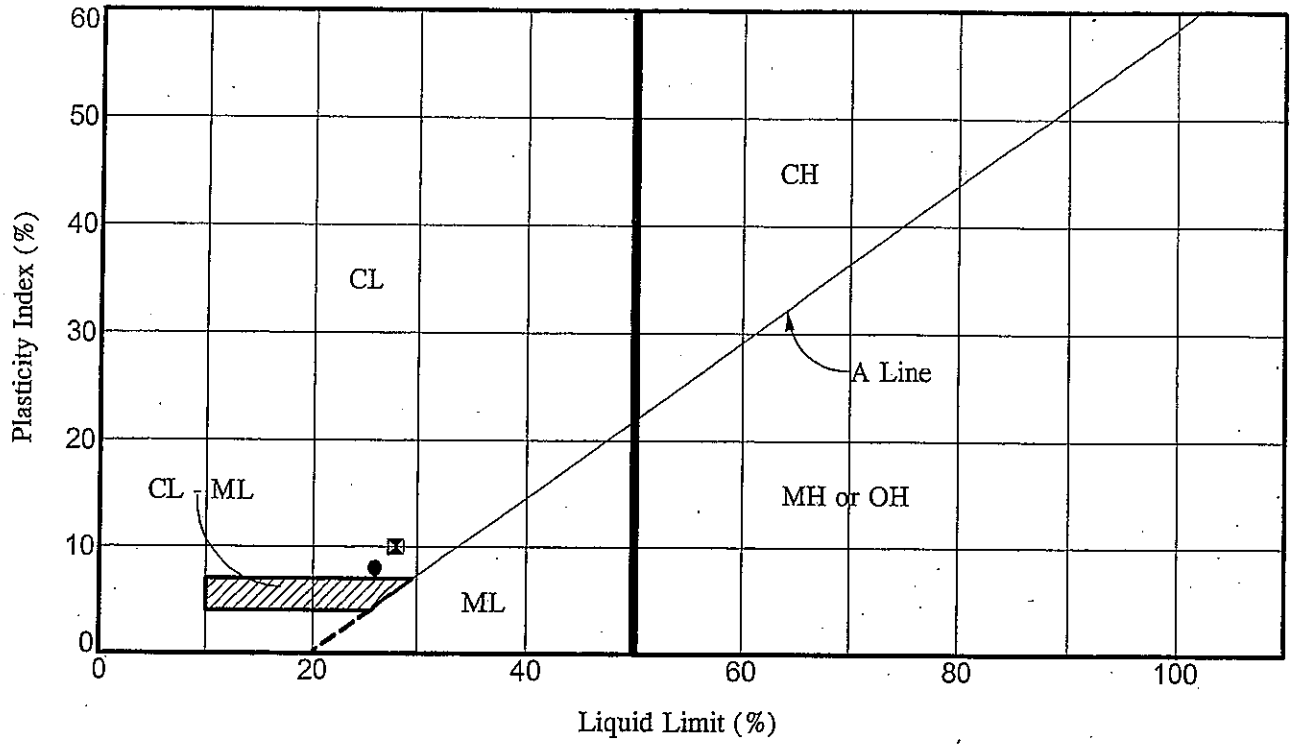
Job No: 205.7.3-2
Date: 8-1-06
Appr: DP

PLASTICITY INDEX RESULTS
RUSSIAN RIVER EQUALIZATION BASIN
SONOMA COUNTY, CALIFORNIA

PLATE
11



ASTM D 4318-84

Symbol	Classification and Source	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Free Swell (%)
●	**BROWN GRAVELLY CLAYEY SAND (SC)** **Test Boring 2 at 24.1 feet and 24.5 feet**	**26**	**18**	**8**	--
⊠	**BROWN GRAVELLY CLAYEY SAND (SC)** **Test Boring 2 at 26.5 feet and 27.0 feet**	**28**	**18**	**10**	--

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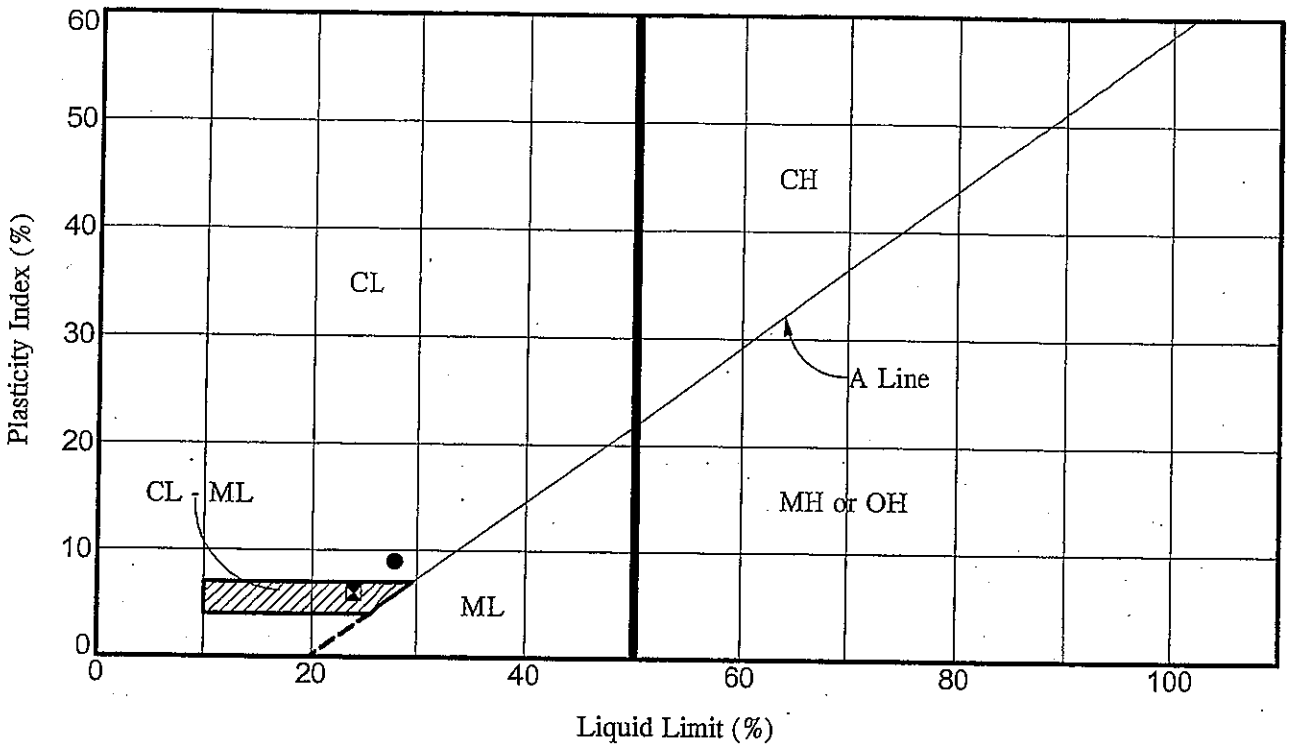
Job No: 205.7.3-2
Date: 8-1-06
Appr: BP

PLASTICITY INDEX RESULTS
RUSSIAN RIVER EQUALIZATION BASIN
SONOMA COUNTY, CALIFORNIA

PLATE
12



ASTM D 4318-84

Symbol	Classification and Source	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Free Swell (%)
●	**DARK BROWN SANDY CLAY (CL)** **Test Boring 3 at 7.2 feet and 7.8 feet**	**28**	**19**	**9**	--
⊠	**GRAY CLAYEY FINE SAND (SC)** **Test Boring 3 at 21.0 feet**	**24**	**18**	**6**	--

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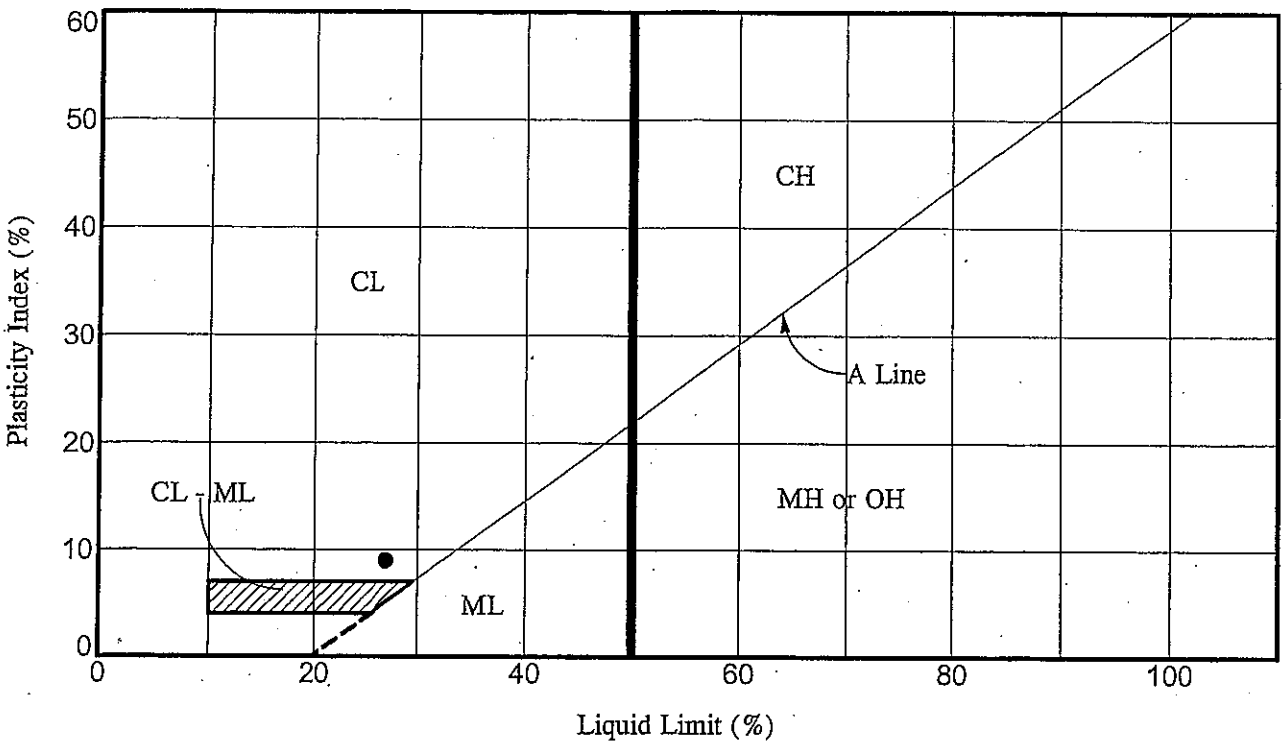
Job No: 205.7.3-2
Date: 8-1-06
Appr: BP

PLASTICITY INDEX RESULTS
RUSSIAN RIVER EQUALIZATION BASIN
SONOMA COUNTY, CALIFORNIA

PLATE
13



ASTM D 4318-84

Symbol	Classification and Source	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Free Swell (%)
●	**GRAY VERY SANDY CLAY (CL)** **Test Boring 3 at 25.7 feet**	**27**	**18**	**9**	--

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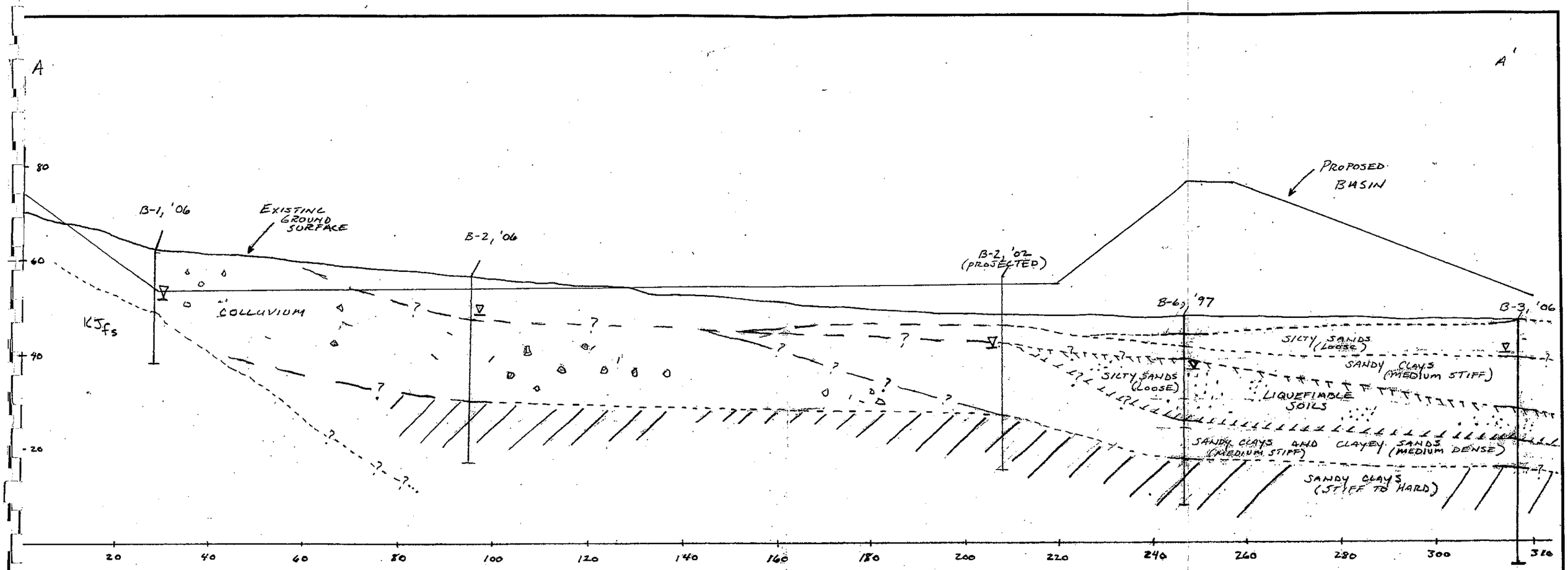
Job No: 205.7.3-2
Date: 8-1-06
Appr: DP

PLASTICITY INDEX RESULTS
RUSSIAN RIVER EQUALIZATION BASIN
SONOMA COUNTY, CALIFORNIA

PLATE
14



0 20

SCALE: 1" = 20' HORIZONTAL AND VERTICAL

Summary of Liquefiable Soils

Boring	Date	Depths
3	2006	19 to 26 feet
5	1997	13 to 18 feet
6	1997	8 to 22 feet

KEY

Symbols

B-1, '06: Boring 1, 2006

Geologic contact; dashed where approximate, queried where uncertain

Approximate water level observed

* CONTACTS BETWEEN SOIL UNITS SHOULD BE CONSIDERED GRADATIONAL AND APPROXIMATE. ACTUAL SUBSURFACE CONDITIONS MAY DIFFER FROM THAT SHOWN.

CROSS-SECTIONS IN NATURE ARE INTERPRETIVE AND SHOULD NOT BE USED FOR PURPOSES OF BIDDING OR ESTIMATING.

GIBLIN ASSOCIATES
CONSULTING GEOTECHNICAL ENGINEERS

Job No: 205.7.3-2
Date: 01-11-07
Appr: BT

INTERPRETIVE GEOLOGIC CROSS-SECTION A-A'

RUSSIAN RIVER EQUALIZATION BASIN
SONOMA COUNTY, CALIFORNIA

PLATE 15